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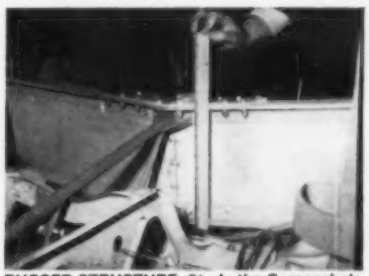

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THE COVER: Anthony Linck caught this Lycoming powered, Piper Comanche 250 with his camera.

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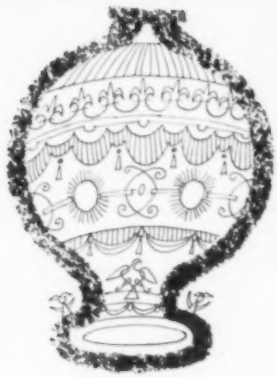
A BRIEF

HISTOIRE D'AIR FRANCE

(that is also a history of French aviation)

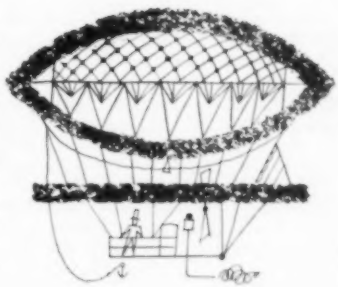
L'HISTOIRE ANCIENNE

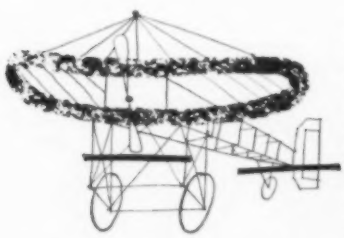


FIRST MEN TO FLY. Joseph and Etienne Montgolfier successfully take to the skies, June 5, 1783. Man's ancient dream of air-borne travel suddenly becomes a practical reality.

L'HISTOIRE "PIONEER"

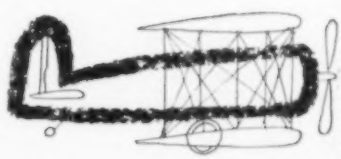
FIRST ENGINE-POWERED DIRIGIBLE. Remarkable speed of 6½ MPH was clocked by Henri Gifford on a Paris-Trappe flight, September 24, 1852. An early demonstration of the French genius for technical achievement that is a tradition with Air France today.



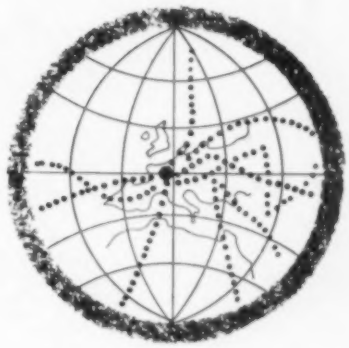


FIRST INTERNATIONAL FLIGHT. French aviation gained new stature when Louis Blériot flew 25 miles across the English Channel, July 25, 1909. This memorable journey focused world attention on the immense possibilities of commercial flight.

FIRST INTERNATIONAL PASSENGER FLIGHT. Air France's flight from Paris to London, February 8, 1919. Eleven passengers made the trip. Flew 187 miles in 2½ hours. Today, Air France passengers fly 1500 miles in the same 2½ hours.



L'HISTOIRE MODERNE



LES PLUS GRANDES ROUTES. Today, Air France the world's largest airline. Routes cover more than 202,000 unduplicated miles...connect 210 cities in 76 countries. Air France is the largest *French* airline, too. Though it cooperates closely with all other French airlines, none are part of Air France. As the official French national airline, Air France maintains its unique identity...the oldest, the largest, the most experienced of all.

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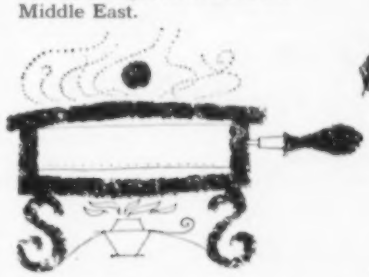

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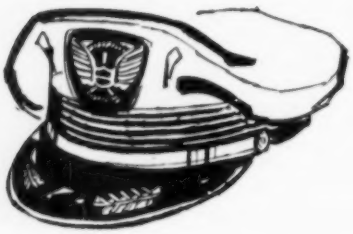

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For other courses, see pages 98, 110

MAILBOX

FAA APPROVAL

I want to take this opportunity to thank you for the very excellent coverage FLYING Magazine gave the Federal Aviation Agency in its February issue.

Your efforts have materially helped us tell the public the story of the duties, functions and services the dedicated employees of the FAA perform in their behalf.

E. R. QUESADA, Administrator
Federal Aviation Agency
Washington, D. C.

CRITICISM OF FAA

I have just finished reading attentively your February issue and the articles written by the several FAA officials.

I then looked for articles which would set forth what industry and customer reaction is to the picture so glowingly painted by these officials . . .

This situation alarms me. I hope you recognize that the aviation community has traded practically all of its few remaining liberties for the efficiency of a dictatorship. FAA is expanding at a cancerous rate. It is the second largest independent agency of the Government. Its actions have led to a major disagreement with the majority of the aviation community on the method and effect of its rulemaking operations. The statement by Dr. Goddard concerning what he has in store for us is one of the most chilling things I have read . . .

ROBERT E. MONROE,
Executive Director
National Aviation Trades Association
Washington, D. C.

• *FLYING is keenly aware of criticism of FAA and has articles in preparation which we hope will generate more light than heat, to help our readers understand the basic issues involved. We are not interested in muddying the subject by disseminating hastily written and vituperative charges. FLYING chose the end of the agency's first year as an appropriate time to offer FAA about 20 pages to present to you, in its own way, its mission, an authoritative and up-to-date description of its organization, and its current and future programs. FLYING told FAA it could write its story as it saw fit. The material was not censored by FLYING. We leave it to you readers to reach your own opinions of FAA's report. This by no means indicates that we agree 100 per cent with FAA policies and procedures. We expect to give similar space to FAA's critics—such as Bob Monroe—who are willing to discuss this important subject thoughtfully and in a constructive manner.*

—R. H. W.

AIA HAS A WORD

Having just finished reading the February issue of FLYING and the excellent account on FAA, I wanted to drop you a line and commend you on this excellent article. Of course, I would have been delighted with just the statement Mr. Quesada made about general aviation, but the whole content of this particular coverage on the FAA is most interesting.

This also gives me the opportunity to tell you how much I enjoy reading the Airman's World and also the editorial content which appear regularly in FLYING.

JOSEPH T. GEUTING, JR., Manager
Utility Airplane Council
Aerospace Industries Association
Washington, D. C.

AOPA ON ANTI-COLLISION PANEL

Article in February FLYING (FAA, Bureau of Research and Development) by A. C. Packard states seven groups are represented on Collision Prevention Advisory Group and then names only six (page 97). AOPA has been an active member since its inception but is omitted. Can you explain omission?

VICTOR J. KAYNE
AOPA Member COPAG
Bethesda, Md.

• *FAA's Capt. A. C. Packard, deputy director of the Bureau of Research and Development, included AOPA in his original manuscript but it was omitted in the retyping in FLYING's office and the omission was not caught by any of our proofreaders. Our apologies to AOPA—ED.*

G.I. "REQUISITIONS" AIRCRAFT

Enclosed is a photo I thought you might find unusual . . . a great topic of conversation to friends, especially those of mutual interest in aviation.

I was granted my private pilot certificate in 1940. Instructed Army primary in 1943; drafted in 1944, and found myself a C-47 crew chief in New Guinea.

We entered Tachikawa, Japan, in October 1945 where I "requisitioned" the aircraft in the photo. As you can see, the ship resembles our PT-17, Stearman. The prime difference was that the powerplant (as close as I could ever find out) was 300 hp. After acquiring the ship, my big problem was how to start it. It was too big to spin by hand and the prop hub had an engaging unit resembling a Model T Ford. The Japanese had a truck with a

(Continued on page 8)

Next step . . . take it upstairs and discover for yourself the exciting differences between the new Twin-Bonanza and all other airplanes. With 340 h. p. supercharged fuel injection engines, the Twin-Bonanza carries 6 at nearly 4 miles a minute!

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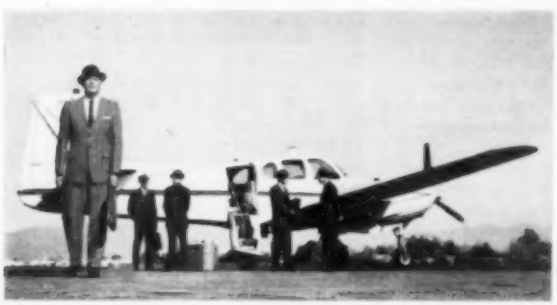

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MAILBOX

(Continued from page 6)

crank unit that they backed up to the ship, engaged into the hub and spun the prop.

Things looked good until I found out that every truck of this type was out of commission. I (improvising) found a lathe, hacksawed the pulley on the prop hub off the shaft and welded it in position. Next I cut a notch in the pulley and put the prop back on. I then loaded the tank with jeep gas, tied one end of a rope to the jeep's bumper, wrapped the other end around the pulley and signalled the man in the jeep to back up.

It worked fine. The engine started, and, after I blew all the castor oil out of it and the smoke screen subsided, it looked like I was in business . . . I had myself a wonderful ride!

The thing, whatever it was called (I never did find out the name of it), fairly leaped off the ground and had me reaching for the trim tab so I could relax forward pressure on the stick while taking off. It really surprised me.

After I got the feel of the ship, I began a little sight-seeing service for the boys in our AACS outfit . . . really had a ball until a 'chicken' colonel arrived on the base and spotted my bird. That was the end of my sight-seeing service; but I gained a lot of experience that I never will forget.

ROBERT GRISCOM
Clearfield, Utah

● *Your airplane was a Tachikawa, Type 95, Model 1, Jap Army trainer—Allied code name "Spruce." The engine was probably a Hamakaze 11, nine cylinder radial, rated at 325 hp.*—ED.

THE BISHOP'S BOYS

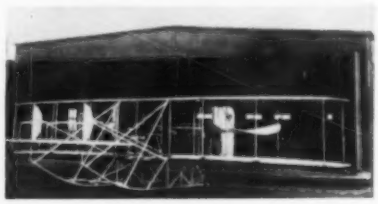
Please extend to Dallas Sherman my congratulations on "The Bishop's Boys" in a recent issue of FLYING. It is a most appealing and well written story, bringing out a human aspect of the Wright brothers' lives which is not generally known.

In the interest of accuracy, however, I would like to make a few technical comments and corrections.

For instance, the rear vertical rudder was not added as a sop to Wilbur's wish for a tail in the rear as intimated on page 90. The 1900 and 1901 gliders had no vertical surface at all. One was added in the 1902 glider as a fixed vertical rear fin or vane, in an attempt to counteract an effect of warping the wings for lateral control, which we now know as adverse yaw due to the increased drag on the side whose angle of attack has been increased. This effect the Wrights discovered during the 1901 gliding flights at Kitty Hawk. This fixed vertical fin was found to give only partial relief so, at Orville's suggestion, it was hinged to act as a rudder to increase its beneficial effect. As you state, this rudder was not controlled independently but was hooked in to operate with the wing-warping. This coupling of the two controls was Wilbur's idea.

Your statement that the Wright glider was "the first successful man-carrying glider on earth" is open to considerable question. It all hinges, of course, on one's definition of "successful." Back some 50 years ago when I started flying, a "successful" flight was one which you could walk away from. To a lot of us students of gliding and soaring, the approximately 3,000 glider flights made by Otto Lilienthal were pretty successful. . . . Whether his method of balance and control could be classified as practical is a matter of question, but the fact that he made a large number of flights is not.

The first airplane's propellers (page 91), far from being enlarged adaptations of the toy helicopter, were the result of extensive and often frustrating literature searches and studies. Finally rejecting all



previous work, the Wrights developed their own design.

On the day of the first powered flight, the brothers drew lots, and Wilbur won the first chance. However, in this attempt the craft did not lift off the launching rail and plunged into the sand at its end. Orville's was the second attempt, and his, as stated, was the first official flight.

The statement "By 1908 they had temporarily given up trying to arouse any practical appreciation of their accomplishments in America" is not quite accurate. Actually the U. S. Army contract with the Wrights for the first experimental military airplane was dated February 10, 1908, and Orville started his contract flight demonstrations at Fort Myer, Va., Army post on September 3, of that year. These tests were terminated by the crash of September 17 when Lt. Tom Selfridge was killed and Orville suffered injuries which were to bother him throughout his life.

It is true that at this time Wilbur was in Europe making demonstration flights which awakened that part of the world to the fact that practical man flight had been achieved. . . . In July 1909, the Wrights fulfilled their Army contract, delivering and demonstrating successfully their two-seat military airplane. This airplane was accepted by the Army by its report dated Aug. 2, 1909.

CAPT. R. S. BARNABY (USNR)
The Early Birds,
Philadelphia, Pa.

● *Pictured above is the Army's first airplane, Wright Type B, accepted, as Captain Barnaby says, at Ft. Myers, Va., in 1909. Now in the Smithsonian Institution, Washington, D. C., it was launched from monorail by means of 1,400 pound weight dropped from a tower in the rear; landed on skids. Lts. Frank Lahm and Benjamin Foulois, the Army's first pilots, received instruction on this airplane.*—ED.

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G. Fjord Christensen
Hjalleise-Odense, Denmark

". . . I have nothing but praise for the TR-102A. It takes my Luscombe 8A in amongst the 707's, Connies, etc. with never a complaint from the tower to me."
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P. M. Jenkins
Independence, Mo.

"Recently had an opportunity to try the TR-102A. We were pleased to find that it does all you claim and more. We would like to be a Nova-Tech dealer. Send one 6-crystal set COD immediately."
J. V. Simpson
Cartersville, Georgia

"We purchased a TR-102A early this year and like it very much. Enclosed is our check for a second set."
Norm Barrett
Middle Grove, New York

". . . I have given the TR-102A a good workout and am very enthusiastic about its fine performance. It justifies all of your claims."
H. L. Baxley
Hume, Va.

". . . The TR-102A has given me tremendous service. I am able to communicate easily with stations 60 miles away that I could not get with my other radio. It amazes me that the TR-102A can do so much and sell for so little."
Calvin Char
Honolulu, Hawaii

". . . I have never dealt with a fairer company. You have always bent over backwards to help me . . . I was in contact with Charleston tower as far out as 40 miles and they complimented me on the quality of the signal, saying that it was actually airline equipment quality."
Glen Sprouse
S. Charleston, W. Va.

MORE THAN 2,500 IN USE . . .

In every type of light plane all over the world. FCC TYPE ACCEPTED.

LOW COST

Every pilot can afford the TR-102A VHF Communications System at the low price of $229. Budget Terms Available. Additional crystals, $10 each, installed and adjusted.

A PRECISION INSTRUMENT

The TR-102A is ruggedly constructed to give years of trouble free service. 23 channel transmitter . . . long range VHF receiver tunes 108 to 128 MC . . . compact and lightweight . . . PERFORMS SATISFACTORILY IN PLANES WITHOUT IGNITION SHIELDING . . . generator not necessary . . . works fine in fabric planes . . . COMES COMPLETE with power supply, VHF whip antenna, and cable, 2 crystals (121.5 Emergency, 122.5 Tower) installed and adjusted, all interconnecting cables, complete maintenance and installation instructions, FULL FACTORY WARRANTY.

Complete POSTPAID **$229**

Don't FLY Without Radio

Increase your flying safety. With the TR-102A you can radio 60 to 100 miles ahead for the weather at your destination. **With VHF an emergency call brings immediate help.**
VHF radio is rapidly becoming mandatory at airports all over the country. Don't be grounded for lack of VHF communications. Make use of all radio facilities set up by the government for the private pilot.

TR-102A INCREASES FLYING PLEASURE

BUDGET TERMS

A first payment of 20% will deliver the Nova-Tech TR-102A or the deluxe new NOVA/STAR. The balance can be paid in 12 monthly installments. **No collateral is required. The pilot's signature is sufficient for immediate delivery.**

The Deluxe New nova/Star VHF Communications System

- ✓ WHISTLE TUNING
- ✓ CABIN SPEAKER
- ✓ BUILT-IN INTERPHONE
- ✓ 10 CRYSTALS installed & adjusted

Only $385, the Nova/Star has features found in the most expensive equipment. **Whistle Tuning**—provides accurate crystal calibrated tuning to the exact frequency you want to receive on.

Cabin Speaker with Audio Amplifier—gives plenty of clear, clean power.

10 Crystals, installed & adjusted—Tower, 122.5, 122.6, 122.7; Radio, 122.1, 122.3; UNICOM, 122.8, 123.0; Ground Control, 121.7, 121.9; Emergency, 121.5. **Built-in interphone with remote jacks.** The system also includes power supply, whip antenna, all cables. Ready for immediate installation.

nova/star Complete **$385** Postpaid

IRON CLAD MONEY-BACK GUARANTEE (FA)

If you are not completely satisfied with your TR-102A or your Nova/Star, for any reason, return it within 10 days and we will airmail a complete refund.

NOVA TECH, INC., 1721 Sepulveda Blvd., Manhattan Beach, Calif.

PLEASE SHIP THE FOLLOWING WITH 10 DAY RETURN PRIVILEGE

☐ **TR-102A VHF RADIO.....$229**
Includes power supply, whip antenna, 121.5 & 122.5 installed, all cables. Install these crystals at $10 each.

☐ Tower 122.6
☐ Tower 122.7
☐ FAA Radio 122.3
☐ UNICOM 122.8
☐ Ground Control 121.7
☐ Ground Control 121.9
☐ FAA Radio 122.1
☐ UNICOM 123.0

☐ **NOVA/STAR VHF RADIO...$385**
Includes power supply, whip antenna, cabin speaker, whistle tuning, built-in interphone, 10 crystals, installed and adjusted, all cables.

☐ 6 Volt ☐ 12 Volt ☐ 24 Volt ($40 extra)

☐ I enclose full payment $..... ☐ Send COD ☐ Budget Terms, I enclose 20%

NAME .....

ADDRESS .....

CITY, STATE .....

AIR MAIL REACHES US OVERNIGHT . . .

Briefings . . .

MONTANA'S Sen. James E. Murray (D.) has introduced a bill to abolish Sunday and holiday customs inspection charges levied on private pilots entering the U. S. from Canada and Mexico. Co-sponsored by Sen. A. S. "Mike" Monroney (D.-Okla.), chairman of the Aviation Subcommittee, the proposed legislation has the support of most aviation organizations according to its sponsors.

FIRST PIPER AZTEC to be sold in the U.S. is now the property of Tuft-Edgcumbe, Inc., Piper distributor at Elgin Airport, Elgin, Ill. George Edgcumbe (left), president of the firm, was given a personal send-off by W. T. Piper, Sr., (right) presi-

dent of Piper Aircraft, as Edgcumbe took off for Illinois. Newest and fastest of the Piper fleet, the Aztec is a twin-engine, 215-mph airplane, capable of carrying five passengers and luggage. With two 250-hp Lycoming engines, it sells for $49,500.

FOR THE SECOND successive year air travelers outnumbered those traveling by sea over the North Atlantic. Last year, nearly twice the number traveled by plane than by ship, an estimated total of 1,650,000 as compared to 884,000. In 1958, when air transport first overtook sea travel, the air total was 1,292,000 as opposed to 950,000 ships' passengers. In 1957, 1,036,000 travelers made the boat crossing.

DR. PAUL GARBER, head curator and historian of the National Air Museum, Smithsonian Institution, has been awarded the 1959 Frank G. Brewer Trophy by NAA, for "outstanding activity in the field of aviation education." Presentation was made in Denver, Col., during recent National Aviation Education Council's air education conference. Dr. Garber joined the Air Museum as curator, June 1, 1920.

AT ITS WASHINGTON, D. C. headquarters —1025 Connecticut Ave., N.W.—National Pilots Association has made a good start toward building a film library, which will eventually encompass a complete refresher course in basic aviation subjects. Available to pilot groups without charge, films for the first three programs in the series are now on hand. David Kratz, member NPA and president of National Insurance Underwriters, St. Louis, Mo., is credited with inspiring the refresher program, and for previewing and selection of films.

FINAL FINDINGS of the Civil Aeronautics Board on causes contributing to the crash of an American Airlines turboprop Electra in New York's East River, Feb. 3, 1959, disclose no evidence of failure in the much discussed new type Kollsman altimeters aboard the aircraft. Ascribing the crash "primarily to failure to properly monitor the flight instruments," CAB, in effect, completely absolves the Kollsman product from any mechanical failure.

BY MID-MARCH the huge task of moving its entire Examination and Records Division from Washington, D. C. to Oklahoma City had been completed by FAA. All inquiries on aircraft registration and airmen and mechanics examinations should henceforth be directed to 621 N. Robinson Ave., Oklahoma City, Okla. Inquiries on aviation educational materials still go to the Office of Public Affairs at FAA Washington headquarters.

RENSSELAER POLYTECHNIC INSTITUTE, Troy, N. Y., has inaugurated a graduate program in Astronautics under its Department of Aeronautical Engineering. With particular reference to design and operation of space vehicles, the program is designed to provide the basic background essential to development and research work in Space Engineering and Science. Titles of available courses, and detailed information relating thereto, are contained in a leaflet available through the Director of Admissions.

CY CALDWELL, pilot and aviation writer for 45 years, has retired(?) to Island Park, L. I., "to write a book." For the past five years he has been with The Martin Company, where in the early 1920s he served as test pilot. A Nova Scotian by birth, he was working in New England as a bank accountant in 1915 when he bought a Curtiss Model B for $800 and taught himself to fly, thereafter devoting himself to aviation. Test pilot, instructor, airline pilot, aviation publicist, notwithstanding, Cy Caldwell is perhaps best known for his writings during the 20 years he was Associate Editor of the now defunct Aero Digest.

CONCERNED OVER the more than 300 casualties in commercial airline operations last year, CAB has taken steps to broaden investigations by assigning a "human factors team" to join its mechanical and operations experts in investigating all fatal accidents. The purpose is "to determine whether any physical disability of the human mechanism may have contributed to the accident." FAA's Office of Civil Air Surgeon and the Armed Forces Institute of Pathology are providing the personnel.

FEDERAL CIVIL AGENCIES are purchasing 44 new aircraft, in fiscal 1961, which will bring their total, including helicopters, to a fleet of 458 units. Included are 37 new aircraft at a cost of $21,375,600. Of these agencies, Coast Guard, the largest operator, plans on three new turboprop aircraft and six helicopters. FAA will add

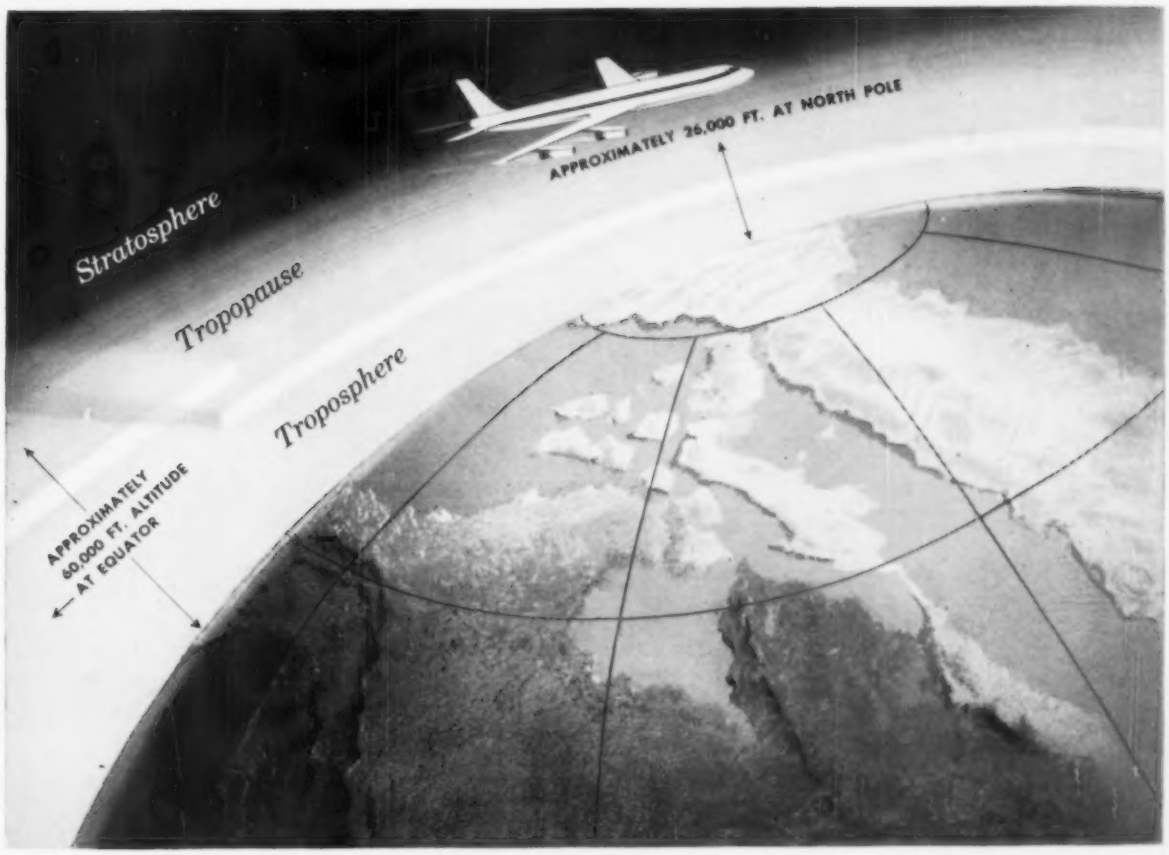
(Continued on page 14)

SHELTERED FROM THE ELEMENTS, passengers for United Air Lines' DC-8 jet transports—and piston-powered aircraft, as well—board the airplane through these telescopic, self-powered, "Jetway" corridors reaching out from the terminal building. Now in operation at San Francisco's and New York's International Airports, United has 19 Jetways on order, nine in service. As other units are delivered, they will be put to use at Chicago, Los Angeles and Seattle.

Mobil — FLY WEATHER-WISE

POLAR FLIGHTS

Low Arctic Stratosphere on Polar Flights . . . Provides Warmer High Altitude Temperatures than in Tropics!



THANKS to a lower troposphere and resulting lower stratosphere, temperatures above approximately 25,000 feet in the polar regions are actually milder than they are at a comparable height in tropical regions . . . and they rarely vary much from between minus 40 to minus 60 degrees Centigrade at jet altitudes. For jet aircraft following the polar route, this means that they have virtually a stable atmosphere for the largest part of their journey.

Knowledge of polar weather conditions at high altitudes makes possible these extreme long-range flights on regular schedule. These flights call for the most exacting flight planning. And, of course, invaluable aids to the exacting flight planning are highest quality fuels and lubricants.

Rely on the finest . . . Mobiljet 158—an ideal long-range fuel—already proved for high performance airline operations. Mobiljet 140—a performance proved airline jet fuel with −40 F Freeze Point.

Mobil

MOBILJET FUELS
MOBILGAS AIRCRAFT
MOBILOIL

MOBIL OIL COMPANY, A Division of Socony Mobil Oil Co., Inc.
150 East 42nd Street, New York 17, N. Y.

THE ALL NEW

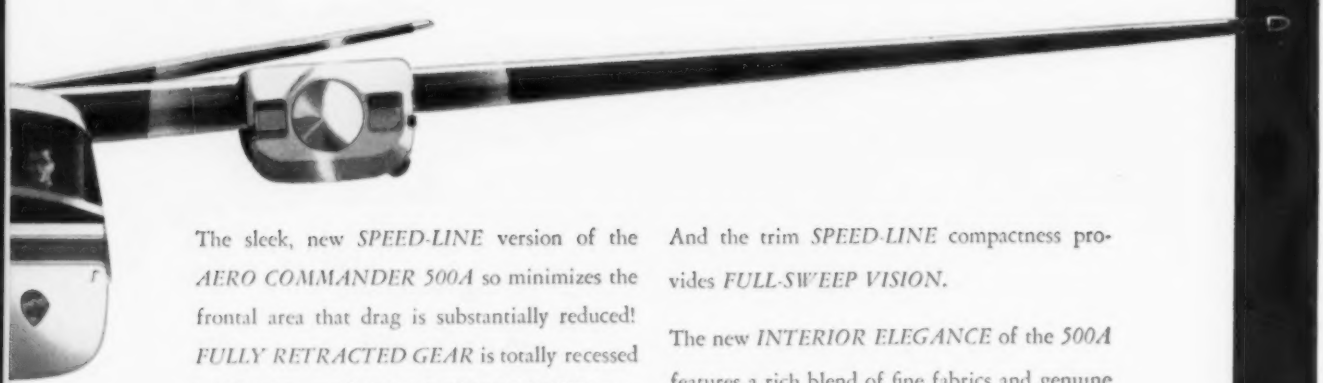
AERO COMMANDER 500A

first of a brilliant series featuring the

SPEED-LINE NACELLE

a new, compact design that

INCREASES SPEED and PERFORMANCE



The sleek, new *SPEED-LINE* version of the *AERO COMMANDER 500A* so minimizes the frontal area that drag is substantially reduced! *FULLY RETRACTED GEAR* is totally recessed within the nacelle. There's *NEW POWER*, too. The 260 hp Continental engines feature *FUEL-INJECTION!* And the *500A* is capable of speeds up to *230 MPH!*

The new design releases exhaust above the high wing making the *CABIN WHISPER-QUIET*. And the trim *SPEED-LINE* compactness provides *FULL-SWEEP VISION.*

The new *INTERIOR ELEGANCE* of the *500A* features a rich blend of fine fabrics and genuine leather in your choice of beautiful colors. Call WHitney 9-5674 for complete details about the all-new *AERO COMMANDER 500A*, first of a brilliant, new series featuring the *SPEED-LINE NACELLE!*

AERO DESIGN & ENGINEERING CO. • BETHANY,

AERO COMMANDER

· OKLAHOMA · A Subsidiary of ROCKWELL-STANDARD Corporation

Briefings . . .

(Continued from page 10)

nine units to up its total to 138, and the Weather Bureau will lease two four-engine transports for hurricane hunting. Other agencies in the group are the Interior Dept., Atomic Energy Commission and Tennessee Valley Authority.

A SELF-CONTAINED, self-powered LF Converter which, when attached to any automobile radio, brings in low frequency aviation weather sequences and control tower chatter, is being marketed by Boulevard Electronics, Inc., 1229 W.

Washington Blvd., Chicago. A transistorized device, it attaches easily to the auto radio under the dash or in glove compartment; tunes 200 to 400 kc weather band, and reception is said to be good within a 100-mile range. Price, $34.95.

IN HIS ANNUAL REPORT to the Aerospace Industries Assoc., president Orval R. Cook (Admiral, USN, Ret.) declared that increased acceptance of small aircraft for business and utility purposes is "one of the brightest spots" in the civil aircraft field. The five-year period 1954-1958 saw production and sale of such aircraft more than double, reaching a total of 6,414 units valued at $135 million. In the first nine months of 1959, the industry had delivered 5,600 units, for a total value of $128 million. In 1958, during the same period, 4,725 units at $102 million were delivered.

VAN'S AIR SERVICE, FAA-approved repair station of Winona, Minn., has opened new facilities for corporate aircraft maintenance and overhaul at Truax Airport, Madison, Wis. To be fully operative by May 1, limited services in maintenance, storage and fuel are presently available. Controlling interest in the new venture, according to B. G. Vandre, president and founder of Van's Air Service, is held by the Dairy Equipment Co., of Madison, manufacturers of milk cooling equipment; and longtime users of company-owned aircraft.

BUTTERFIELD TRAIL AIRPORT, second airport for Abilene, Tex., has opened for business. Don Graves, owner-operator of Graves Flying Service, Brownwood, Tex., is manager and fixed base operator. Patterned after a design for highway airstrips, drafted by the State Aeronautics Commission, the airport is located north of Abilene on U. S. Highway 83-277. A 3,150-ft. N-S runway, of which 2,500 feet are paved, is ready. A shorter E-W runway is under construction. Two ten-plane hangars are completed, with additional units, a terminal building and restaurant planned for the near future.

ORGANIZED SPECIFICALLY to serve the light twin and single engine aircraft trade, Island Airmotive, Inc., has opened an engine service facility at Zahn's Airport, Amityville, L. I., N. Y. Specializing in Continental and Lycoming engines, the firm offers new and remanufactured engines, as well as engine exchange and overhaul. Prime mover in Island Airmotive is Ralph Quinlan, businessman, pilot-owner of a Piper Apache, and trainer-owner of "Zippy", popular TV chimpanzee.

TAHITI, most fabled of the South Sea Islands will become accessible to the tourist when, on April 2, South Pacific Air Lines begins a weekly "blue-ribbon" service from Honolulu using Super Constellations. Pending completion of runways at the capital city of Papeete, expected sometime this fall, passengers will deplane at Bora-Bora and proceed to Papeete by flying boat, a distance of 160 miles. At outset one-way first class fares are $390; tourist, $285, each subject to ten per cent discount on round trips.

KING RADIO CORP., Merriam, Kan., is manufacturing a single unit transmitter-receiver that provides transmit/receive communications and navigational reception, thus relieving the pilot from having to choose between omni or communications—just when both are all important. Designated the KX-100, the unit

consists of two receivers—one covering communications channels and gang-tuned with the transmitter; the other, a 100-channel navigation receiver, independently tuned. Available for 14- or 28-volt operation, the KX-100 is also designed to operate with King's KI-200 Omni-Localizer Converter-Indicator or any other modern converter-indicator.

FIRST WESTERN sports parachuting center was inaugurated in mid-January at Ryan Field, Hemet, Calif. Operated by Parachutes, Inc., which also operates the country's first established sports parachuting center, at Orange, Mass., the California center features intermediate

(Continued on page 124)

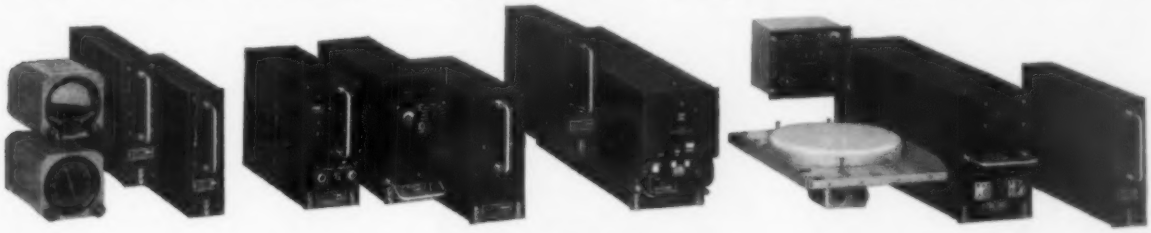
DURING RECENT OPENING of "Old Tucson," a million-dollar western entertainment center at Tucson, Ariz., three old-time airplanes from the Arizona Chapter, Antique Airplane Association, provided a thrilling interlude for the thousands of spectators. Bill Porter leaned from his 1929 Fleet (right) and sprinkled champagne on the town while Gordon Cooper and John Thurman flew escort in 30-year-old Waco biplanes; concluding show with low level passes and aerial dog fights.

TO GOOD BUSINESS... *the Collins equipped* JetStar

Lockheed's new 550 mph JetStar has introduced business men to true executive maneuverability. Equipped with Collins Electronics, the JetStar combines the safety and dependability of a scheduled airline with the flexibility and convenience of a privately owned airplane.

Collins equipment on the JetStar includes a dual FD-105 Integrated Flight Director System, dual VOR-101 Navigation Systems, dual 17L-7/51X-2 VHF Communication Systems, a DF 202 ADF System, the 621A-2 ATC Transponder System, dual 51V-3 Glideslope Receivers and the 51Z-2 Marker Beacon Receiver. These lightweight, compact equipments are the natural choice for the high performance business transport aircraft. Maintenance ease and fast installation are additional bonuses of Collins Electronics.

A Collins-equipped JetStar allows jet-age decision makers to make an approach to good business anytime . . . anywhere in the world.



COLLINS

COLLINS RADIO COMPANY • CEDAR RAPIDS, IOWA • DALLAS, TEXAS • BURBANK, CALIFORNIA

(Advertisement)

Wiggins 'copter sprays cranberry bog, one of several helicopter operations Wiggins pioneered.

Hustle-Bustle

A behind-scenes report on "New England's most versatile airways" —Wiggins Airways, of Norwood, Mass.

by HERB FISHER
International aviation authority, veteran test pilot, author

"Our evaluation tests on this new *Foul-Resistant* plug indicate Champion is about 10 years ahead in plug development," Wiggins President Joseph Garside (2nd from left) tells (l/r) Tom Alegretti, Champion; E. W. Wiggins, Jr., Wiggins Vice-Pres.; Herb Fisher; and Fred Valentine, Service Mgr.

Wiggins Airways in Norwood, Mass., is a hustle-bustle outfit of diverse character and versatile personality. You're not there long before you get caught up in the spirit of things. The people like their work—their enthusiasm is reflected in a prideful perfectionism—and their customers obviously like their work, too.

Wiggins has a 30-year history of grass-roots aviation experience that's about as comprehensive and varied as any I've ever run across. Primarily, the company is sales-service-modification center for both domestic and overseas business-type aircraft. But the backstage romance of Wiggins Airways lies in its versatility:

In a modern new hangar, skilled craftsmen fit light aircraft with special electronic gear and fuel tanks for ferry delivery to Europe, Africa, South America. Customers have included foreign governments, big industry and royalty —among the latter, King Hussein of Jordan, who had two twin Beech Bonanzas outfitted at Wiggins.

In adjacent new hangars, other technicians do complete exterior-interior conversion jobs . . . maintain and overhaul all aircraft for Provincetown-Boston Airlines . . . do complete servicing on scores of business and private aircraft.

Elsewhere at Wiggins' Norwood Airport facility, student pilots take pre-flight in link trainers or solo aloft. Wiggins' flight instruction provides for training all the way up to an airline pilot rating.

In Greater Boston's only aviation showroom—Wiggins—businessmen look over new Piper Twin Apaches, Comanches and Tri-Pacers. Wiggins handles all Piper sales in southern New England—sells reconditioned and converted used aircraft as well—and maintains an aviation stockroom with a complete inventory of aircraft parts, accessories, supplies. Wiggins is the main parts-and-equipment depot for the New England states.

Wiggins' flight, sales and manufacturing activities are concentrated here at Norwood Airport. Of some 4,500 to 5,000 landings per month, about 100 a week are visiting business aircraft.

Max Conrad, world-record-holding "Flying Grandaddy," chats with Tom Alegretti and Fred Valentine, prior to ferrying Piper Apache to Finland.

Outfit

Wiggins does complete maintenance and overhaul for Provincetown-Boston Airline fleet. Here Fred Valentine and Tom Alegretti (l/r) check installation of Champion's new *All-Weather* Foul-Resistant spark plugs, which alleviate the New England moisture problem.

Meanwhile, "back on the farm," Bell helicopters spray New England apple orchards . . . treat forests and kill brush . . . fly powerline patrol . . . crop-dust . . . shuttle personnel and equipment. Wiggins pioneered many of these helicopter operations; in the past 12 years, Wiggins 'copters have become increasingly valuable to New England agriculture and industry, saving millions in time, money and manpower.

Wiggins "air-taxi" planes take businessmen, VIP's or vacationers on time-saving flights through the six New England states and beyond. *An unusual feature of this "air-taxi" service is the opportunity for passengers to get free flying instruction while en route to and from their destinations.* (Quite a few air-minded passengers have picked up their pilot licenses almost "automatically" this way.)

Probably most unusual of all Wiggins' diversified operations, however, is its research-experimentation-manufacturing facility at Norwood Airport. A lot of this, surprisingly, is in no way connected with the aviation industry—though a considerable portion is.

Wiggins' machine shop work includes such ambitious undertakings as development and prototype engineering of components for atomic submarines, missiles and experimental aircraft. Wiggins has built everything from little automatic dispensers for private industry to complete military aircraft of entirely new design—such as a complete STOL for Fairchild. Wiggins once built a 40-foot collapsible bridge for the Army, an aluminum bridge capable of supporting an 80-ton tank; the bridge can be folded up and tucked into the belly of a transport plane. The military looks to Wiggins for such other services as magnafluxing of vital components of atomic subs.

In this advanced research and experimentation phase, Wiggins was among the first to give full field evaluation tests to Champion Spark Plug Company's new Foul-Resistant plugs—much in demand since Max Conrad lifted eyebrows by flying solo from Casablanca to Los Angeles, for a non-stop world record, *without plug fouling*. Wiggins subjected the REM40E Foul-Resistant plugs to 200-hour comparative tests with other plug types, utilizing both Tri-Pacer and Apache aircraft. The All-Weather version of the new Foul-Resistant plug was included in these tests.

"From the results of our evaluation tests," said Wiggins President Joseph Garside, "*I'd say those self-cleaning Foul-Resistant plugs put Champion about 10 years ahead in plug development!* The two-prong electrodes, bigger bores and longer core noses enabled combustion gases to keep the firing ends blasted clean, whereas other plugs in the tests showed heavy lead and carbon fouling deposits.

"We're phasing-out all other plugs in our own fleet, Herb, re-equipping both fixed-wing aircraft and helicopters with Foul-Resistant plugs.

"Customer demand for the new plug is terrific, now, too."

The All-Weather version of the new Foul-Resistant plug has special significance in New England, Service Manager Fred Valentine told me, "because moisture is the big ignition problem here. The All-Weather plug practically eliminates this major headache." (Having flown just about every type of aircraft under the conditions Fred speaks of, I know well what he means.)

Prior to 1956, Wiggins' operation was scattered. Now, nearly all manufacturing, sales, airplane servicing and overhaul and flight activities are consolidated in these modern facilities at Norwood Airport. The company also leases hangar, office and ramp facilities at Logan International Airport, Boston, for contract fueling, storage and servicing of large aircraft—both scheduled and non-scheduled airlines and itinerant aircraft.

Keep an eye on this hustle-bustle outfit—have your plane serviced there next time you're around Boston.

CHAMPION SPARK PLUG COMPANY
TOLEDO 1, OHIO

Wiggins' first aircraft, a Spartan with a Wright J6-7 engine, bought in 1929. It was equipped with Champion "Aero" Spark Plugs, one of the world's first successful ceramic plugs.

THE THIRD IN A SERIES
FOR YOUR
AIRCRAFT COMPARISON FILES . . . TEAR OUT →

THE COMPLETE STORY OF THE NEW FLIGHT\SWEEP CESSNA LINE

the next best thing to taking a demonstration flight!

poised, powerful, preferred...the world's best all-around light twin

surgi
fligh

310d

SK

The Cessna 310d — Time and distance business barriers vanish under the sleek wings of the distinguished 310d. You move far, fast, and flexibly . . . solving problems . . . exploring new opportunities — wherever and whenever they exist. And the conference room quietness, the unmatchable beauty, comfort, and convenience of the 310d provide a perfect place to plan as you travel — a private office in the sky. The new flight/sweep Cessna ranges halfway across the nation — non-stop . . . provides executive lounge comfort for five at speeds up to 242 miles per hour. All this plus true twin-engine safety and performance!

SEATING CAPACITY	Five
MAXIMUM SPEED	242 mph
CRUISE SPEED	220 mph
MAXIMUM RANGE*	1440 miles
RATE OF CLIMB: Twin Engine	1800 ft./min.
Single Engine	440 ft./min.
TAKE-OFF RUN	800 ft.
LANDING ROLL**	620 ft.
SERVICE CEILING: Twin Engine	21,300 ft.
Single Engine	7,700 ft.
BAGGAGE CAPACITY	200 lbs.
GROSS WEIGHT	4830 lbs.
ENGINE	Two, 260-HP, Continental Fuel-Injection Engines

All Performance Figures are based on Gross Weight. * 130 gals. – **Maximum Landing Weight, 4600 lbs.

The Skylark . . . said simply, the flight/sweep Skylark is a big airplane with a practical price tag! The best o to add stepped-up power, performance, and prestige to y picture *without* leaving the economy plane class, the beautiful Skylark offers "fabulous bonus features"* normally considered optional on other planes but bu standard on the Skylark! All these plus all the traditio ease features of the Cessna line . . . and all priced as value package . . . to save you money!

*See Skylark product brochure equipment list

urging new power...
light/sweep styling

KYLARK

Skylark for Sixty
best opportunity
tige to your travel
ss, the big, bold,
ures"* — features
but built in and
traditional flight-
riced as an extra

SEATING CAPACITY	Four
MAXIMUM SPEED	149 mph
CRUISE SPEED	142 mph
MAXIMUM RANGE	760 miles
RATE OF CLIMB	850 ft./min.
TAKE-OFF RUN	735 ft.
LANDING ROLL	590 ft.
SERVICE CEILING	15,900 ft.
BAGGAGE CAPACITY	120 lbs.
GROSS WEIGHT	2350 lbs.
ENGINE	175-HP, "Power-Geared," Continental

All Performance Figures Are Based on Gross Weight

outstanding dollar for dollar
value leader

17

The Cessna 175 — Dollar for dollar, the smart-looking, swift-moving 175 is still unmatched in price and performance! Flight/sweep styled as the standard economy step-up choice, the 175 has also earned proven popularity as a first-choice airplane! Outstanding features such as an improved power-geared engine, "floating cowl" suspension, the new long, low look, and all the exclusive Cessna "drive up — drive down" flight features — *Para-Lift flaps, Land-O-Matic gear* and *high stability wing* — plus low initial price, amazing low maintenance and operational cost — makes the 175 the dollar for dollar value champion — the ideal way to leave competitors behind!

SEATING CAPACITY	
MAXIMUM SPEED	
CRUISE SPEED	
MAXIMUM RANGE	
RATE OF CLIMB	
TAKE-OFF RUN	
LANDING ROLL	
SERVICE CEILING	
BAGGAGE CAPACITY	
GROSS WEIGHT	
ENGINE	175-HP, "Powered-Ge

All Performance Figures Are Based on Gross

outstanding dollar for dollar
value leader

practical choice...positive
perfect for modern

175

— Dollar for dollar, the smart-looking, swift-
l unmatched in price and performance! Flight/
e standard economy step-up choice, the 175 has
popularity as a first-choice airplane! Outstand-
as an improved power-geared engine, "floating
the new long, low look, and all the exclusive
— drive down" flight features — *Para-Lift flaps,*
r and *high stability wing* — plus low initial price,
tenance and operational cost — makes the 175
lar value champion — the ideal way to leave
d!

SEATING CAPACITY	Four
MAXIMUM SPEED	147 mph
CRUISE SPEED	140 mph
MAXIMUM RANGE	755 miles
RATE OF CLIMB	850 ft./min.
TAKE-OFF RUN	735 ft.
LANDING ROLL	590 ft.
SERVICE CEILING	15,900 ft.
BAGGAGE CAPACITY	120 lbs.
GROSS WEIGHT	2350 lbs.
ENGINE	175-HP, "Powered-Geared," Continental

All Performance Figures Are Based on Gross Weight

The Cessna 172 — No more time and distance barriers to new and needed business. When you take control of new, fly-away business travel freedom in your own flight/sweep Cessna 172 for '60, you simply get in and GO! The only *full-size,* all-metal, 4-place, low-cost business airplane, the 172 gives a full measure of balanced business travel benefits — and then some! For out of the profit-proven past of the 172 comes a new design for a fabulous flying future! Greater speed, faster climb, longer range, and the new longer, lower flight/sweep look equip the 172 with improved performance and prestige — all designed to help you leave your competitors behind!

SEATING C	
MAXIMUM	
CRUISE SP	
MAXIMUM	
RATE OF C	
TAKE-OFF	
LANDING	
SERVICE C	
BAGGAGE	
GROSS WE	
ENGINE	

All Perform

ive performance
n business

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172

ATING CAPACITY	Four
AXIMUM SPEED	140 mph
RUISE SPEED	131 mph
AXIMUM RANGE	790 miles
TE OF CLIMB	730 ft./min.
KE-OFF RUN	780 ft.
NDING ROLL	680 ft.
RVICE CEILING	15,100 ft.
GGAGE CAPACITY	120 lbs.
OSS WEIGHT	2200 lbs.
GINE	145-HP, Continental

Performance Figures Are Based on Gross Weight

150

The Cessna 150 features side-by-side seating for simple, effective flight instruction . . . all-metal construction for low maintenance and upkeep . . . Para-Lift flaps . . . Land-O-Matic gear . . . big, power-to-spare engine and high stability wing — all the exclusive Cessna "drive up — drive down" simplified flight features . . . perfect for safe, dependable flight training, inter-city commuting or patrolling.

SEATING CAPACITY	Two
MAXIMUM SPEED	124 mph
CRUISE SPEED	121 mph
MAXIMUM RANGE	630 miles
RATE OF CLIMB	740 ft./min.
TAKE-OFF RUN	680 ft.
LANDING ROLL	360 ft.
SERVICE CEILING	15,300 ft.
BAGGAGE CAPACITY	80 lbs.
GROSS WEIGHT	1500 lbs.
ENGINE	100-HP Continental

All Performance Figures Are Based on Gross Weight

180

The Cessna 180 — Profit-packed payload . . . power-to-spare engine . . . high stability wing . . . perfect for out-of-the-way travel and transportation. The high performance 180 adds power, payload, range, and extra versatility to the Cessna utilaplane concept. Perfect for places other planes cannot get into and out of — the 180 is convertible to floats and skis . . . can serve as a passenger plane or cargo ship!

SEATING CAPACITY	Four
MAXIMUM SPEED	170 mph
CRUISE SPEED	160 mph
MAXIMUM RANGE	845 miles
RATE OF CLIMB	1130 ft./min.
TAKE-OFF RUN	555 ft.
LANDING ROLL	350 ft.
SERVICE CEILING	21,500 ft.
BAGGAGE CAPACITY	120 lbs.
GROSS WEIGHT	2650 lbs.
ENGINE	230-HP Continental

All Performance Figures Are Based on Gross Weight

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SEATING CAPACITY	Four
MAXIMUM SPEED	170 mph
CRUISE SPEED	160 mph
MAXIMUM RANGE	845 miles
RATE OF CLIMB	1030 ft./min.
TAKE-OFF RUN	555 ft.
LANDING ROLL	560 ft.
SERVICE CEILING	19,800 ft.
BAGGAGE CAPACITY	120 lbs.
GROSS WEIGHT	2650 lbs.
ENGINE	230-HP Continental

All Performance Figures Are Based on Gross Weight

The 182 . . . millions of miles of *balanced high performance* has earned the title "decathlon performer" for the flight/sweep Cessna 182 for Sixty . . . Powerful, instantly ready for action, the 182 again leads its class in performance, styling, and prestige! Big stretch-out cabin for four . . . Land-O-Matic gear, high-stability wing . . . Para-Lift flaps . . . new third window visibility . . . plus the great new "GO" look of flight/sweep styling . . . marks the 182 as the best standard medium-price value!

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the first and only single-engine commercial airpl
with high stability wing ... retractable landing ge

182

SEATING CAPACITY	Four
MAXIMUM SPEED	167 mph
CRUISE SPEED	157 mph
MAXIMUM RANGE	835 miles
RATE OF CLIMB	1030 ft./min.
TAKE-OFF RUN	555 ft.
LANDING ROLL	560 ft.
SERVICE CEILING	19,800 ft.
BAGGAGE CAPACITY	120 lbs.
GROSS WEIGHT	2650 lbs.
ENGINE	230-HP, Continental

All Performance Figures Are Based on Gross Weight

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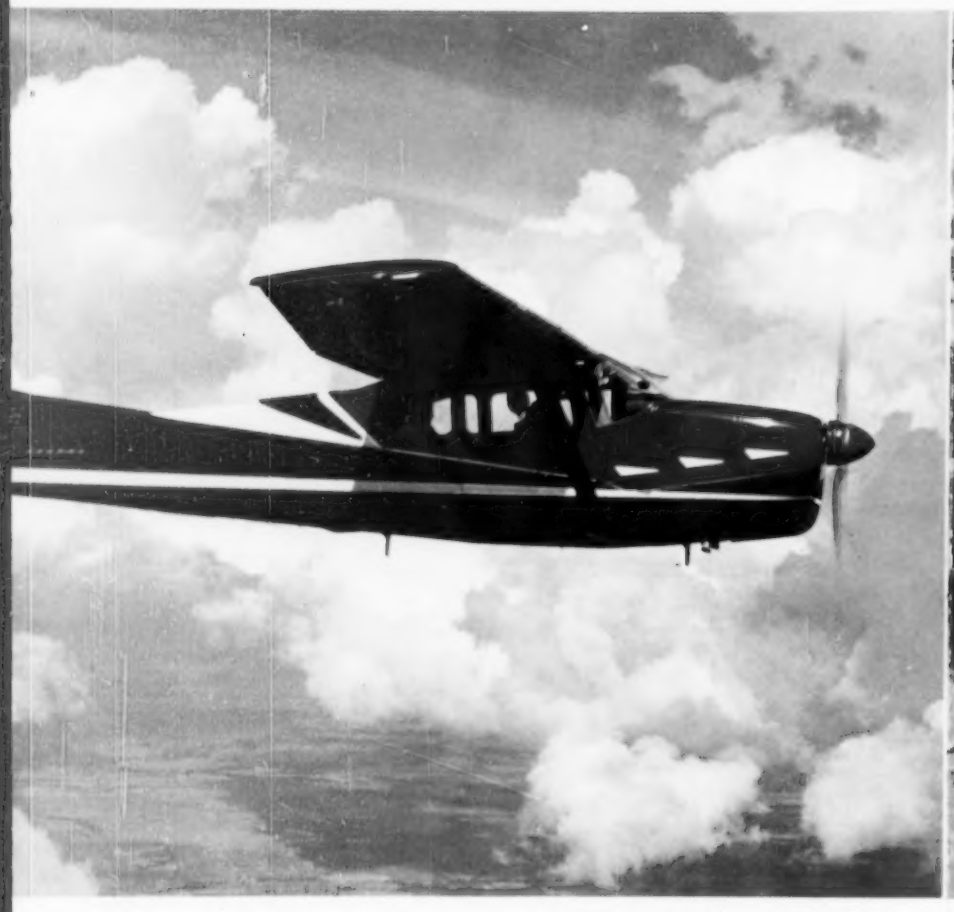
The all-new Cessna 210 . . . perfectly fills the need and the speed requirements / of modern businessmen. The big, power-to-spare, 260-HP engine / with simplified fuel injection / provides a smooth, safe cruise speed of 190 mph / extra "spare nothing" elegance in interior materials selection and styling adds comfort, convenience, and a fabulous feeling of fly-away freedom / to a host of modern flight-ease features / all of which make the all-new 210 the most complete / the most wanted / package of single-engine power / performance / and prestige / available today!

210

SEATING CAPACITY	
MAXIMUM SPEED	19
CRUISE SPEED	19
MAXIMUM RANGE	110
RATE OF CLIMB	1300
TAKE-OFF RUN	
LANDING ROLL	
SERVICE CEILING	20,
BAGGAGE CAPACITY	
GROSS WEIGHT	29
ENGINE	260-HP, Continental, Fuel-Injection

All Performance Figures Are Based on Gross Weight

d only single-engine commercial airplane
stability wing ... retractable landing gear



practical,
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210

CESSN

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uel injection / provides a smooth,
xtra "spare nothing" elegance in
yling adds comfort, convenience,
freedom / to a host of modern
make the all-new 210 the most
ckage of single-engine power /
able today!

SEATING CAPACITY	Four
MAXIMUM SPEED	199 mph
CRUISE SPEED	190 mph
MAXIMUM RANGE	1100 miles
RATE OF CLIMB	1300 ft./min.
TAKE-OFF RUN	740 ft.
LANDING ROLL	520 ft.
SERVICE CEILING	20,700 ft.
BAGGAGE CAPACITY	120 lbs.
GROSS WEIGHT	2900 lbs.
ENGINE	260-HP, Continental, Fuel-Injection Engine

All Performance Figures Are Based on Gross Weight

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310d

210

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HAVE YOU READ?

By JAMES F. SUNDERMAN

THE OCEAN OF AIR, by David Blumenstock (Rutgers Univ. Press $6.95).

Airmanship is made up of many skills. Knowledge of the air, its composition, behavior and relationship to flight is perhaps the most important.

This is why David Blumenstock's definitive study of the atmosphere, from earth's surface to its thin edges, is a must for airmen. Part One of the 450-page volume analyzes and discusses the physical order of the air ocean, treating its heat system, temperature patterns, nature of wind currents, moisture and the many other fundamentals of meteorological science. Part Two covers man's exploration and observation of the atmosphere, the techniques of weather forecasting, the reasons for climatic changes and weather control measures. Part Three relates the atmosphere to human existence and endeavor, showing its impact on industry, commerce, agriculture, war and history. A discussion on nuclear weapons and the atmosphere, as well as the effects of nuclear detonations and fallout is especially timely and informative.

THE EDGE OF THINGS, by William E. Barrett (Doubleday, $3.95).

William Barrett, pilot and aviation follower for more than 20 years, probes into the mind of flyers who have experienced, during flight, visions or actual sight of creatures, beings and fantasies. Perhaps these reported phenomena are hallucinations as there is no scientific explanation for them. But then for centuries similar visions were reported by men who have stood watch on the lonely decks of ships at sea. Barrett's book is a collection of two novels, "Flight From Youth" and "The Blue Sheep," and two novelettes, "The Destroyer," and "Velma." These stories, ranging from WWI, to the jet age, portray the impact of flight on the creative mind of man. Though fantasies, they are based on a broad knowledge of the air and of the men who fly. Whether or not the reader can accept the incredible, Barrett's book makes excellent reading.

THE NAVY BLUE BOOK, edited by Tom Compere and William F. Vogel, Jr. (Military Publishing Institute, paperback $1.50, hardcover $4.95).

Second in the series of military reference guides of which the Air Force Blue Book was first, the Navy edition closely follows the format of its predecessor. Written in very readable narrative style, it contains articles by prominent military writers and Navy officials, covers every facet of the service, its history and organization. Considerable space is devoted to Naval aviation, guided missiles and space projects. As stated by the publishers, "its purpose is to help bring about a better understanding of the U. S. Navy, both by the public and the men and women in the service. And that it should do very adequately.

U. S. MARINE CORPS AIRCRAFT 1914-1959, by William T. Larkins (Aviation History Publications, $5).

William T. Larkins, author of the book, is probably one of the ablest aviation historians of our time. Marine Corps Aircraft 1914-1959 is the result of 23 years of research and compilation of photographs and material into a vivid pictorial history of Marine Corps aviation. The 490 photographs, a number of them taken by Larkins, are extensively captioned and supplemented by thorough documentation of aircraft and squadrons.

THE STORY OF THE U. S. AIR FORCE ACADEMY, by Lawrence C. Landis (Rinehart, $3.95).

A popularized account of the Air Force Academy from its concept in the post WWI era to the ultra modern institution it is today. Landis describes the cadets' four-year term, the curricula, the on and off duty activities of students. A rundown on opportunities and duties in the Air Force after graduation sums up this excellent guide for the young adult.

IT'S YOUR LIFE, JOE: AN EXPERT'S ADVICE ON AIR SAFETY, by Col. A. M. "Chic" Henderson USAF (Ret.) (Vantage Press, $2.95).

With an outstanding career of specialization in air safety measures and 127 jumps to his credit "Chic" Henderson is well qualified to write on care and treatment, of a flyer's personal equipment and the techniques of successful emergency bailout, descent and landing. Especially informative is his treatment of bailout at high altitudes and jet speeds, a program he pioneered in 17 downward ejection tests from the B-47 at altitudes up to 45,000 feet and 600 mph speeds. His personal counsel should be required reading for all, from fledglings to veterans.

AGARD FLIGHT TEST MANUAL, edited by Courtland D. Perkins and Enoch J. Durbin, 4 vols. (Pergamon Press, $15).

Second revised edition of the technical handbook on analysis and testing of aircraft performance, stability, control and instrumentation. For engineers, students, test pilots and instrumentation specialists.

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Over the scene, he makes a series of passes — dropping markers, jumpers and equipment. Since much of this work is done in valleys, Train must first skim over the near ridge, slow to the edge of a stall to make his drop, then slam on full throttle and bank hard left to clear the ridge at the far end. He averages five of these ticklish passes each trip . . . and up to seven trips a day during rough fire conditions!

"My life depends upon my engines and my fuel," says Mr. Train. "That's why I use Chevron Aviation gasoline. It gives me more power on those loaded takeoffs, and during my get-aways over the fires. What's more, it never fouls my spark plugs — keeps my engines running sweet.

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TIP OF THE MONTH

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Climate

GILL ROBB WILSON
Publisher

IT'S APRIL. Spring is here. The snow line is moving up the high hills. The ice is going out of the creeks. The migratory birds are about their preflight planning. The sodden prairies are drying under the gentling of the winds. The days are appreciably longer. The sap is beginning to flow. The trees are unpacking their buds to cover bare limbs.

An old pilot's thoughts are invaded by memories of a back country boy and springtimes of long ago when this same primeval tug at life was a bittersweet thing of indelible impression. How a boy's imagination would butt and bawl at the future like a hungry calf. How the tides of his dreams would run out toward the deep seas of the years and crash back against the rocky headlands of the realities about him—the pinching poverty and the stark negations of the cloistering mountains.

But nothing could withstand the pull of the spring. For spring isn't merely a season. It's a climate. It can bring about miracles in the deep woods and it can bring about miracles in the minds of men.

It has always seemed to an old pilot that a boy sets his face to the spring when he chooses citizenship in the airman's world. The affairs of The Air Age are ceaselessly bringing about such breath-taking vistas as have their counterparts in the inspirations of springtime.

I never see a sapling reaching its fingering arms to the sun in the spring sky but what I think that some day a young man of the airman's world will have acquired enough of knowledge and inspiration and faith to lift up his imagination to whatever creative Divinity there be and announce that he is prepared to receive the next great body of revelation. And just as does the tree in the spring climate, I am sure he will have his answer. It may come in the whispering of a still small voice or in the thunderings of public conscience or in the moral reforms essential to survival of a civilization that has grown acutely aware of its vulnerability to self destruction.

But come it will. The young man will cry out, "Show me Thy Face," and at that time another measuring of the centuries will originate.

Sometimes I pause to meditate on the birthright with which flight has endowed history. What an irony that such a simple thing as a fresh viewpoint should be the key to such a flood tide of awakening truth—that man in the sky should come to see not just to the ground beneath him or to the horizons around him but to the uttermost parts of the earth and beyond.

As we stand in the springtime of this era of searching in space for a better destiny for civilization, I am sure that additional extra mundane knowledge will reward us. But I am not sure that this will be our greatest reward. I tend to think that the next major breakthrough will be within mankind—his powers of introspection; his understanding of the relationship of intelligence and morality; his more acute interpretation of immortality; his mastery of mental telepathy.

The frost line of his inhibitions will recede. The sodden valleys of his prejudices will dry up. He will drape his intellectual nakedness with understanding.

And the delightful part of this to an old pilot who whittles on a strut before a hangar in Valhalla will be in remembering that the climate in which civilization started on its greatest growth was in his days on earth, The Air Age.

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THE B-70 CONTROVERSY

Will the VALKYRIE ever fly?

By JAMES J. HAGGERTY, JR.

WHAT'S THE B-70 ARGUMENT REALLY ALL ABOUT? A WELL KNOWN MILITARY

IN A WALLED-OFF corner of a North American Aviation plant near Los Angeles, barred to all except those cleared for secret, sits a mockup of what may be the last of the family of manned military bombers.

It is the super-streamlined, trisonic B-70, nicknamed the Valkyrie, the most controversial airplane since the B-36 became the subject of a national furore in the late forties.

The controversy stems from a Department of Defense order, issued late last year, curtailing portions of the B-70 program. Since then, the B-70 has become a symbol in the old argument as to how much we should spend on defense and the corollary wrangle on whether we should continue development of manned combat aircraft or place more and more reliance on automated weaponry.

The debate about the B-70 has an important bearing on the future of aeronautical development but, like most heated controversies, it has gone out of focus. Because of its importance to the country—and to civil as well as military aviation—FLYING in this report attempts to frame the controversy in its proper perspective.

B-70 represents a major advance in aircraft design in that it can cruise at Mach 3, three times the speed of sound, or roughly 2,000 miles an hour, over a distance of several thousand miles, where current supersonic aircraft fly most of their missions at subsonic speeds and then "dash" for a brief portion of the flight.

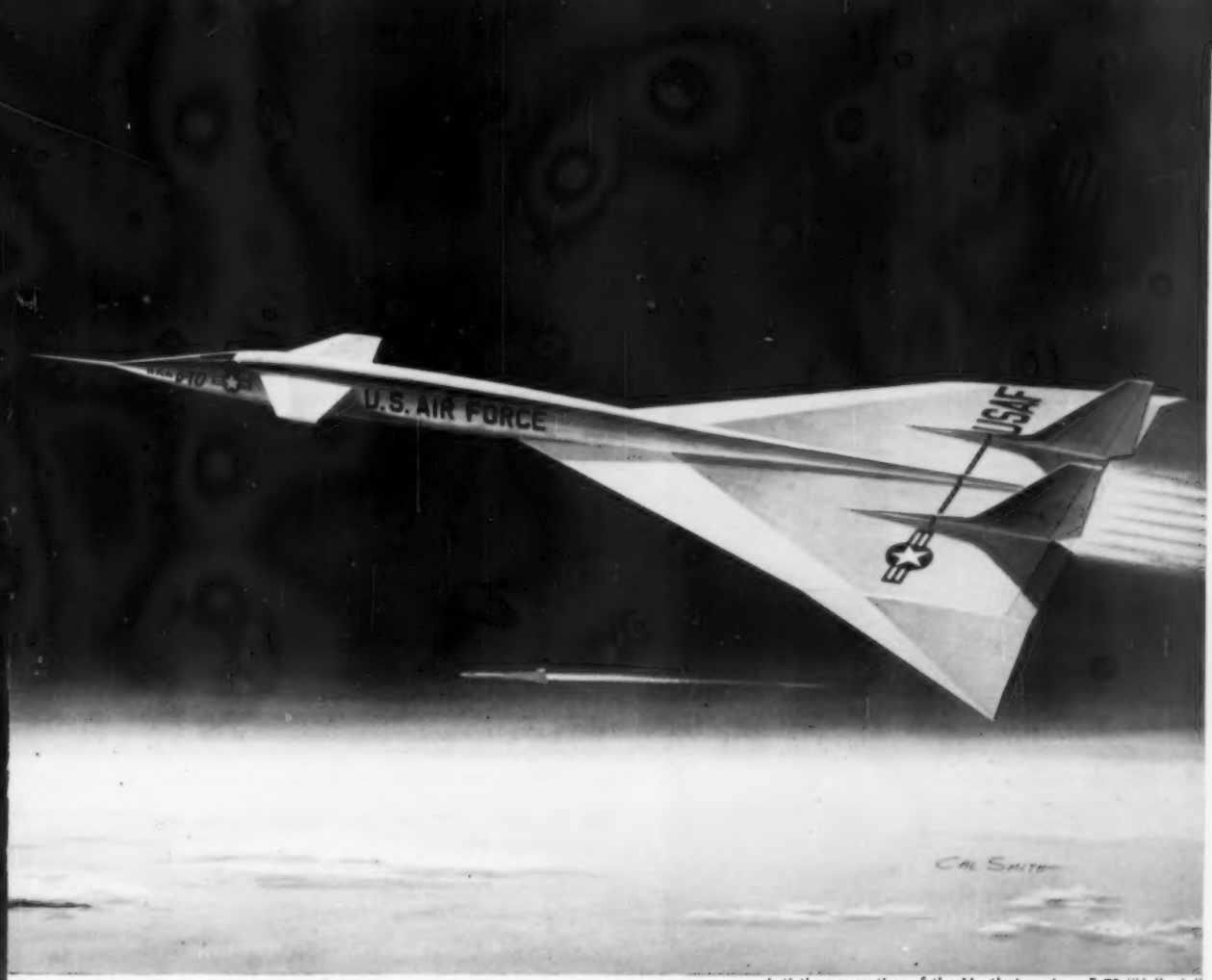
Powered by six General Electric J-93 engines, it will fly at 80,000 feet with an unrefueled range capability of about 8,000 statute miles.

It has been called a "chemically fueled" bomber, a term which has caused some confusion. Originally, the use of high-energy or "exotic" boron-base fuels was considered, but development in this area lagged and the boron fuels will not be available within the developmental period of the prototype XB-70. The performance figures cited are based on plain, ordinary jet fuel.

From a weight standpoint, the B-70 will be the largest airplane ever built, grossing about a half a million pounds, a 25 per cent weight increase over the heaviest version of the Boeing B-52. Its physical dimensions approximate those of the B-52, although a comparison lacks validity because of the difference in design. Span of the B-70's delta wing is 115 feet; it is 170 feet long.

Its external appearance has been termed "radical," but it is hardly that, although obviously a Mach 3 airplane will differ in appearance from its subsonic counterpart. The B-70 has a long, slender fuselage with a sharply tapered nose; stubby, canard wing surfaces behind the cockpit and a large delta wing with the tips turned downward. The six engines are buried in the rear of the fuselage, below twin vertical stabilizers.

The importance of this airplane lies in its speed and altitude capability and it gets into the missile versus air-



Artist's conception of the North American B-70 "Valkyrie".

WRITER SUMMARIZES THE COMPLICATED SITUATION BRIEFLY, AUTHORITATIVELY.

craft debate. Most military airmen favor the "mixed force" concept, in which the manned bomber would supplement the long range missile, adding the finishing touches to a job of destruction which might be only partially accomplished by missiles, and handling the visual reconnaissance that is vital to any successful air operation.

Without the B-70, this job will fall to the subsonic B-52s, whose ability to handle it has been enhanced by the addition of air-to-surface missiles. The B-52, however, will become less and less efficient as Soviet technology brings forth new defensive weapons, until eventually it loses its ability to penetrate defended territory, forcing complete reliance on missiles.

There is another angle which champions of the B-70 cite as important. Military strategy involves more than warhead tossing. In the cold war, you can gain a plus by forcing the enemy to diversify and spread thin his developmental effort. The B-70, capable of penetrating very high and very fast from any corner of the compass (unlike fixed-base missiles whose approximate trajectory is known in advance), puts a heavy burden on the Soviet research and development program.

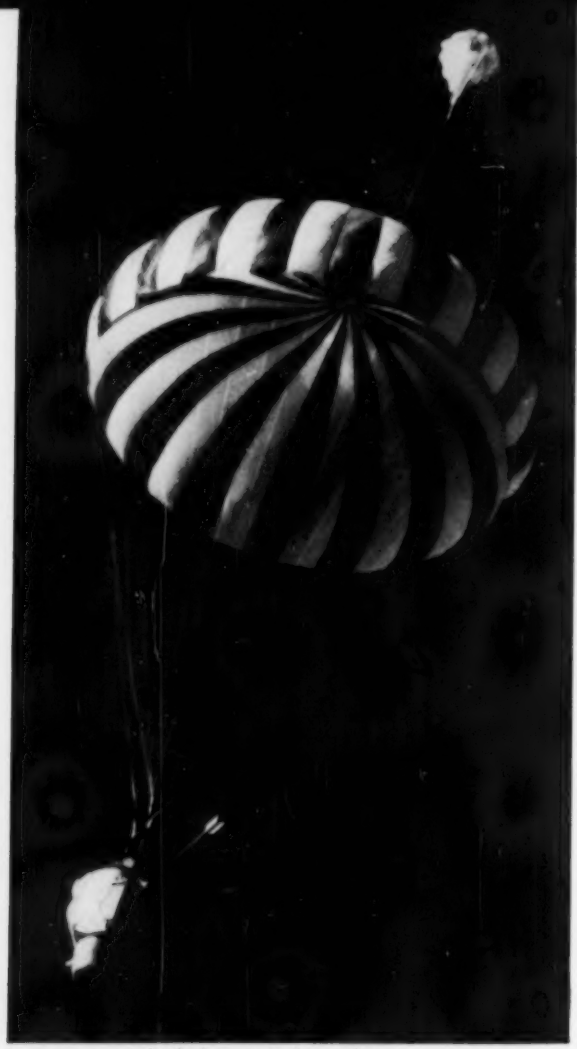
Now, the status of the B-70 program.

Adherents of the B-70 talk as though the program were canceled and in a sense they are right. It is *not* canceled as a research endeavor; however, as a complete weapons system, its service date has been moved so far back into a vague future that it cannot be considered part of the upcoming weapons inventory.

To enlarge on that, the original program envisioned construction of 13 complete B-70s, with bombing, navigation and countermeasures systems needed to make it a fighting airplane. Because of its greater speed and payload, it was reckoned that this number represented the equivalent of one B-52 group. Later groups were planned.

The curtailment order cut the program back to two prototypes, but there is currently only enough money for one. The order also wiped out the development of the bombing, navigation, electronic countermeasures and other important systems, so that the B-70 now in development will be only a shell capable of demonstrating high performance, by no means a combat bomber. Present development schedules are still pending determination, but the likely flight date of the prototype is now 1963. After that, it might still be ordered into production, entailing a long delay because the cutback systems will still have to be developed and the airplane re-tooled for production, making it a weapon for the late 1960s if it ever becomes one at all.

To those critical of defense policies, the "gutting" of the B-70 program offers heavy caliber ammunition for election-year target shooting. They can pound away on the "eggs in one basket theme" and can find innumerable reasons for carrying on the *operational* B-70 project.



In emergency, individual pressurized capsules for each B-70 crew member can be blasted through escape hatches by rocket power and descend by automatically triggered chutes.

The defenders of the cutback have a strong point. The B-70, most optimistically, would have been an operational bomber in 1965, and even then not in large numbers, probably only the single group once envisioned. They can point to the history of the Thor and Atlas missiles, which have achieved remarkable degrees of accuracy and reliability in relatively short periods, as evidence of what can be expected of automated weaponry during the next half decade, making the "eggs in one basket" theme sound pretty attractive.

They can add that the B-70 would be the most expensive aircraft program ever undertaken, running into several billions for a re-equipment of SAC units. Assuming a continuing 10 per cent of the gross national product for defense (a magic figure which seems to have become standard), could not the same money be better spent on missile development?

B-70 proponents love to jump on that argument. Let us, they say, by all means develop missiles to the hilt. But must they be launched from fixed ground positions, highly vulnerable whether they are above or below the surface (as in the silo-based Titan and Minuteman)?

If underwater launch of nuclear warheaded missiles from mobile atomic submarines is considered, what about an aerial launching platform which can move as far in one minute as a sub can in an hour?

Assuming successful development of the small, solid-propelled air-launched ballistic missiles now in the works, the B-70 could carry about half as many such weapons (8) as does the sub, which cannot quickly return to base for a "refill." (The B-70 can carry eight ALBM's of the new solid-type under development; the atomic sub carries 16 Polaris type FBM's.)

Arguments like these can go back and forth ad infinitum, but on one point nearly everybody is agreed: whether or not the B-70 is restored as a weapons system, at least the prototype research and development program should be carried on. Militarily it would be prudent, since changing conditions (like a nuclear weapons ban which would make missiles useless as long range bombing systems) might dictate a later restoration of the program.

Military usage aside, there are other strong reasons for continuing the program. The B-70 is the only American Mach 3 operational flying machine program in active status and, from the standpoint of aerodynamic, structures and propulsion experience alone, it would be worth the investment.

It also lends itself as a hull for the "someday" nuclear powered airplane. Although the initial nuclear plane is likely to be subsonic, one school of thought says, "Why?" By waiting a little longer for successful development of the liquid metal nuclear power system (not as far along as the air cycle system), the B-70 would be convertible to nuclear power with very little external change and it would be able to maintain supersonic performance.

Space researchers are also interested in a large plane with a very high altitude capability as a mobile booster for satellites and probes. High altitude launching above most of the atmosphere permits more efficient use of the available rocket power in such vehicles.

Finally, and probably most important, is the civil utility of a large Mach 3 plane. The United States cannot afford to neglect development of a supersonic civil transport, from the national prestige standpoint. All of the work involved in the current prototype B-70 program is directly applicable to the civil transport and it will help speed the day when such a plane can make its appearance.

That, encapsulated, is the B-70 story. Choose your side and join the argument. END

Chief B-70 pilot Al White of North American Aviation inspects individual capsule after drop. Gas filled rubber bag absorbs landing impact.

Don't be misled on FAA's revised regulations. An authority on flying tells what new Private Pilots must know.

WHAT THE NEW PRIVATE PILOT REQUIREMENTS REALLY ARE

By JOSEPH B. DUCKWORTH

ON NOVEMBER 16, 1959, the Federal Aviation Agency issued Civil Air Regulation Amendment 20-12. This amendment to Part 20 of the Civil Air Regulations constituted a substantial step in the FAA's safety program designed to improve the competence of the student, private and commercial pilot.

Briefly, the amendment provides for an increase in the knowledge, experience and skill requirements which must be possessed by applicants seeking Private and/or Commercial Pilot Certificates after March 16, 1960.

Strangely, issuance of this amendment brought forth some apparently premature and possibly misleading interpretations of the intent and clearly expressed provisions of the new regulation.

I say strangely for two reasons. First, the new requirements have been the subject of exhaustive discussion and comment since the issuance by the Civil Aeronautics Board on February 14, 1958, of Draft Release 58-2. Second, the new regulation is distinguished by its unequivocal provisions and clear wording. It means what it says, and does not say what it does not mean!

What "misinterpretation" that exists seems to center around the new Private Pilot requirements, particularly the skill requirements; which provide that the applicant must demonstrate in simulated instrument flight his ability to control the aircraft by sole reference to the flight instruments. It is the purpose of this article to clarify these requirements as specifically set forth in the regulation.

First, let's have a look at the problem which dictated he new requirements.

The high proportion of fatalities occurring in accidents involving private pilots on cross-country flights points up the basic problem of inadequate qualification. Poor flight planning and lack of a sound technique in control of the aircraft by sole reference to the flight instruments once visual contact with the ground has been lost seem to be the chief factors involved. Such inadequacies are the chief target *(Continued on page 76)*

ABOUT THE AUTHOR: After ten years as a captain on Eastern Air Lines, Col. Joseph B. Duckworth, USAF (Ret.) designed, developed and implemented the Army Air Corps (now the Air Force) system of instrument flying and instrument flying training. After World War II, he was appointed Director of the Safety Bureau of the Civil Aeronautics Board, the agency responsible for all safety regulations in civil flying. Receiving a regular commission, he was subsequently retired in 1953 for physical disability. Since that time he has taught at Albion College and served as a consultant on instrument flying and instrument flying training. He is the author of "You and Instruments," a manual of instrument flying for the Private Pilot first published in FLYING Magazine *as a two-part serial in the April and May 1955 issues. He plans to reissue this manual in book form in the near future.*

Corporate and private aviation is moving at a fast pace today and this operator approaches it in a businesslike fashion.

By DON DOWNIE

1

2

1.
Air Oasis parts room at Long Beach.

2.
Jimmy Mont, president of Air Oasis and his wife, Betty, who is secretary-treasurer.

3.
The Long Beach operation of Air Oasis.

4.
Patio at Long Beach headquarters.

3

WHAT MAKES AIR OASIS GROW?

YOU CAN'T Get Better Service Anywhere," is the motto of Air Oasis. Nice words, but hard to live up to in these days of all-out competition. This expanding California aircraft company operates on that premise.

"We try to operate our aviation activities like a business," said Air Oasis president Larry Hunt. "All our men who contact the public wear business shirts, ties and coats. Every aircraft salesman is also a flight instructor and must also have a commercial ticket with multi-engine and instrument ratings."

Air Oasis sends all its managers and key personnel to school for additional training. The managers of the three Air Oasis bases in Long Beach, Fresno, and San Diego, Calif., are now enrolled in the Institute of Technology, taking a two-year course in business administration or in night school at the University of Southern California.

Each of the ten salesmen in the three California branches must teach at least one businessman to fly every month. Last year Air Oasis salesmen taught 178 businessmen to fly without charge. The students were selected on the basis of those having both the means to buy aircraft and the need for air transportation. Of the 178, all but four eventually bought new or used aircraft from Air Oasis.

4

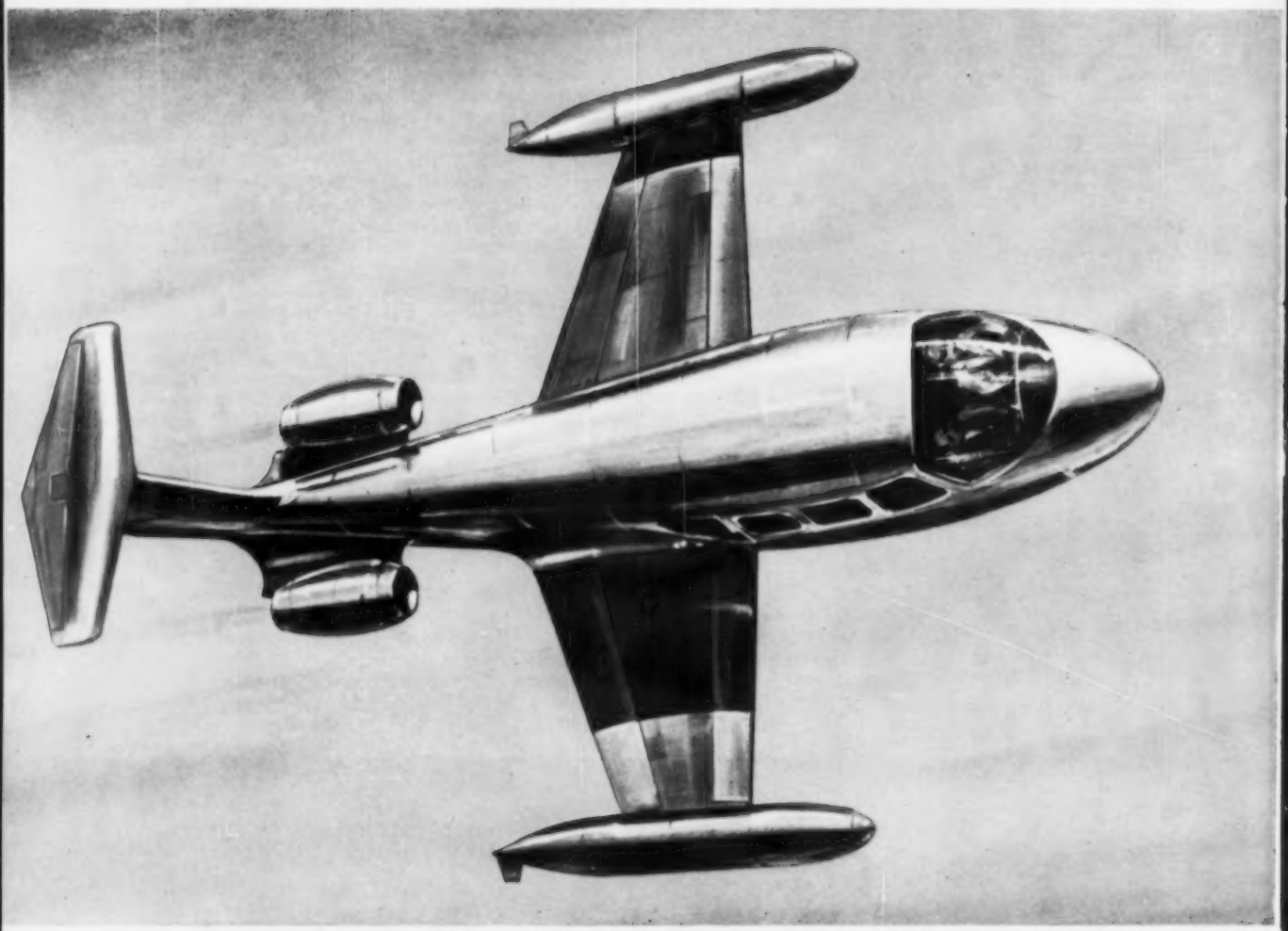
With this aggressive sales approach, it is not surprising that Air Oasis and its 15 authorized dealers sell ten per cent of Cessna's total production. In 1959, this group sold 252 new Cessnas and did over $5,500,000 in gross sales and service. Their goal for 1960 is 275 new aircraft. Last year the top Air Oasis salesman sold 20 new and 25 used aircraft. He won a paid vacation for himself and his wife in Honolulu, in addition to the Cessna factory prize point system. The number two man received a diamond wrist watch.

One of the reasons that Air Oasis grows is the perseverance of president Larry Hunt. He breathes, eats and sleeps aviation. When his family doctor suggested golf for relaxation and offered to play 18 holes with him once a week, Larry bought some clubs and gave it a try. The doctor, completely disinterested in aviation, soon became one of Larry's students. Now he is an avid private pilot, and Larry Hunt has not been on a golf course in over a year.

The Air Oasis staff try never to miss a bet. Each salesman must make two calls a day on persons he has never met. The sales staff keeps a sharp eye on local newspapers to spot sales prospects who need aircraft. When a Long Beach architect was awarded a contract at Vandenberg Air Force Base, some 100 miles north, Larry's wife, Betty, clipped the item out of the paper and the next morning an Air Oasis salesman was making a call. The result was a contract for charter flights between Long Beach and Vandenberg—30 minutes by Cessna 310. The architect was able to increase his scope of operation and garner additional work, primarily because he was always available for in-person consultations rather than depending upon phone calls.

"Every charter flight is also an aircraft demonstration," explained Hunt.

Typical of the aggressive sales approach that pays off in both sales and service expansion is the case of the well-to-do cotton farmer in central California. His holdings covered some 92,000 acres in (*Continued on page* 110)



Artist's conception of the Lear dream ship which will reach speeds and altitudes generally considered unattainable today.

A REVOLUTION in executive aircraft design must come by 1965 if the current boom in this segment of general aviation is to continue its growth, says William P. Lear.

Why?

"Businessmen are demanding it," he insists. "They've had a taste of jet speed on the airlines. Now they know business aircraft must offer the same performance—and more."

The "more" is what Bill and I were talking about on his recent visit to the West Coast from his headquarters in Geneva, Switzerland.

Sitting behind his desk in the Santa Monica plant office overlooking Clover Field, Lear talked with machine gun rapidity on his favorite subject—how to advance the state of the art of general aviation.

"We've increased performance by small increments from year to year," he said, pointing to a wall chart. "But now it's time for a major breakthrough."

That breakthrough, he says, will be a completely redesigned executive ship that will make the most of available jet-thrust power, micro-miniaturization equipment techniques and more attention to functional facets of overall design.

"For example, why take up a lot of space with a built-in rest room?" Bill asked with a grin. "A rest room is an admission you're spending too much time getting where you want to go."

By cutting down on such extras, the Lear dream ship will be a magnificent shell wherein the flying businessman will ride in magic-carpet comfort and at speeds and altitudes generally considered unattainable today with such aircraft.

Lear's interest is not altogether altruistic, of course. It stems from his activity as an executive pilot, not as a plane builder. His engineers are busy on far-reaching research and development projects that are perfecting the ultimate in automatic flight control. And such products will need a lively market tomorrow.

By 1965, says Lear, executive ships will be flying under completely automatic control, runway to runway.

"Business planes must offer something to businessmen that they can't buy on the airlines," Lear pointed out. "And that is a 100 per cent operational guarantee they can

William P. Lear in the "front office" of his company's Twin Beech.

Bill Lear predicts for the Mid-Sixties

A NEW ERA IN EXECUTIVE JETS

By DON DWIGGINS

fly, come hell or high winds, in any kind of weather."

Recently, Lear got a call from the Federal Aviation Agency, notifying him he had 17 "irregularities" filed against him at Los Angeles International Airport.

"What's an irregularity?" Bill asked the FAA inspector.

"Well it's not exactly a violation, Bill," said the FAA man. "But you've been landing repeatedly below what we consider safe minimum weather conditions. I'll have to fly with you and see how you get away with it."

As a fog bank rolled in, Bill and the inspector climbed into his Learstar to orbit the field. On final approach the tower advised Lear the ceiling was down to 100 feet, visibility a quarter-mile.

"I just let George land it," Lear confided. The inspector he said, passed him, but muttered, "Bill, if you fly in any worse weather than that, we'll have to refer you to the Bureau of Mines for clearance!"

It's that last 100 feet that ruins airline schedules, Lear pointed out. "Why switch from autopilot to manual control at the critical moment when you really need automatic control?"

Lear sees today's airline pilot as captain of a multi-million dollar "corporation" who should spend his time monitoring the automatic flight control systems instead of horsing the craft around the sky with bare hands.

Reliability of flight control systems comes from what Bill calls an "abundancy of redundancy." By that he means using up to four autopilot systems at once, so that, if one fails, three backup systems can guarantee foolproof control.

To reach this goal, Lear is going in for intensive work on microminiaturization. The result, he says, is that four complete autopilot systems will weigh only 250 pounds—"about two minutes worth of jet fuel."

A pioneer already in low-cost autopilot systems and simple automatic stabilizer units, Lear nevertheless sticks to sophisticated equipment "which all instrument pilots will demand."

(A new inexpensive, lightweight Lear autopilot, the transistorized, miniaturized L-3, will be on the market in mid-year.)

While the major airlines will be keeping better schedules by flying at lower weather minimums under completely automatic control by 1965, says Lear, the business fleet still will have something to offer in unique service.

"Decentralization of industry and world population is moving industry away from metropolitan centers," Lear told me. "Thus firms that are not on the main lines must rely on their own fleets of executive craft to get their bosses and salesmen around the country."

Originally, Lear observed, executive craft were used primarily by air-minded executives who found the ships gave them prestige, and a means of getting off for the Canadian fishing lakes on week ends.

"Now they've found that the executive ship is indispensable in keeping pace with a high-speed competitive industry."

When businessmen wake up to the realization they need airline jet speed for thier own executive fleets, they're going to demand reliability, safety and comfort not available today, Lear figures.

"Your flying executive will refuse to step from an $8,000, air-conditioned auto into a $125,000 ship without proper pressure and temperature control," he insists, adding that, on flights below 5,000 feet, pressurization is relatively unimportant, but when tomorrow's executive ships begin operating regularly at 15,000 to 20,000 feet for jet economy, it will be a major matter.

Of all the problems confronting development of the executive jet plane, Lear rates the engine as foremost. None, he says, is currently available to provide required thrust at a cost low enough for a $100,000 ship.

Lear has set that price as the goal for the executive jet, because he feels it will find a mass market more quickly than craft priced to sell for up to $1 million. "I'm pretty sure such a ship can be built for that price, if we scrap a lot of old ideas and start with a fresh approach."

First, of course, Lear rules out propellers as being too complicated and not so reliable as a pure-jet power delivery system. To match reliability of a good turbine engine, Lear emphasizes that the need for reliable electronic systems is proportionately higher. A complete automatic flight control system for a $100,000 executive jet could be installed for $25,000.

Lear sees a rear-fuselage engine installation as preferable for two reasons—reduction of noise level below that of jet airliners, and elimination of propeller or jet-induced slipstream turbulence (*Continued on page* 119)

THE AIRMAN'S WORLD

THE PANTOSCOPE of an earlier day
was a cockpit windshield craz'd and grey
from the summer heat and the winter cold
and soot from a rust flaked manifold;
but pilots could see that a time would be
when the wing grew strong to lift man free
from the narrow prospect of scenes nearby
till his mind remolded through his eye
and rested no longer in calm content
that his destiny was as his feet were bent
in a labyrinth of ways which always led
back to the days of the past he fled.

And thus as he saw, it has faded away,
that pantoscope of the former day,
and the heavens resound to the passing of man
who travels in sonic caravan
with cheek light pressed to the windowed scene—
the white of the peaks and the prairie's green,
the God-made whole and the man-made bits
where the great hills tower and the village sits,
the length and the depth and the breadth in one
vast vista of earth and sky and sun!
And pilots must ponder what they have wrought
in the panorama of human thought.

Not seven league boots but seven league sight
it seems to me is the heart of flight.

GILL ROBB WILSON

Hall L. Hibbard, vice president engineering (left) and Robert E. Gross, board chairman and president of Lockheed Aircraft Corporation.

PART II

LOCKHEED

INDUSTRIAL GIANT OF THE AIR AGE

By GILL ROBB WILSON

Publisher

Clarence L. "Kelly" Johnson, vice president for engineering and research.

J. E. Caneday, vice president, public relations.

B. W. "Bert" Holloway, assistant vice president, public relations.

Director, Flying operations, "Tony" LeVier.

ON THE BASIS that a good name is to be preferred rather than great riches, the Lockheed division of the Detroit Aircraft Corporation was sitting on top of the world in the autumn of 1931.

True, the parent company had just gone broke but Lockheed's heavenly named ships—Vega, Altair, Sirius, Orion—were doing a stellar job of introducing civilization to geography. Furthermore, manager Carl Squier had been making money for Detroit with his Burbank project. His problem, however, wasn't in making money but in keeping it, or at least enough of it to pursue adequate research and development—the lifeblood of any aviation manufacturing corporation in those days; and now, for that matter. But Detroit persisted in draining off the cash and Burbank couldn't go on forever in sale of static design.

Had the Michigan financiers possessed a concept of the air age equal to their vision of the automotive era and spun off the Lockheed division to continue as a separate entity, they might have retrieved their investment a thousandfold. That's the one thing they lacked—a concept. And it was the one thing Squier had—that and a hunch that the "good name" philosophy would pay off if he could find somebody with just a few riches to keep it flying.

Possibly a case could be made out against the automotive moguls for shortsightedness in relation to the industrial opportunities of airpower—the

Marshall "Pop" Headle

MARSHALL "POP" HEADLE AND HIS LOCKHEED PILOT STAFF AS THEY APPEARED IN 1940

A. J. "Capt. Blue" Black

same case that could be made out against canal operators in relation to the early railroads; and against the railroads in relation to the advent of trucks and buses; and indeed in degree against numerous "commissions" and "authorities" which are set up to deal with multiform media of logistics—highways, docks, tubes, tunnels, bridges, airports, etc.

I think, however, that the common denominator is not a matter of lacking vision so much as it is a matter of preoccupation with a primary interest. In the broad evolution of transportation, the canal people originally did dabble in railroad projects and the railroaders in turn did explore the idea of truck and bus lines and even of air commerce. But such interests just couldn't be pursued with a full head of informed imagination any more than an authority or commission can look over the horizon from the mouth of a tunnel or through the tollgate of a bridge.

And, as far as that's concerned, it seems very certain that the preoccupation of air transport with passenger traffic between distant great cities to the comparative neglect of greater mass traffic within area perimeters, and even more importantly of cargo development, will appear in retrospect to have been as visionless as any example which preceded it. Yet, who could, with any semblance of rightly dividing the word of truth, charge that the leadership of our air commerce has been without vision or imagination. No, it isn't astigmatism from which progress suffers so much as it is preoccupation—that, and always the pressure, the endless pressure, of economic limitations. There is just never enough money for everything, regardless of how much money there is.

So there sat Squier, as 1931 lengthened to 1932, searching the horizon of the air frontier for somebody who thought that a good name was great riches and would bet on it. The tools and jigs which Detroit had used in making metal fuselages for some of the Vegas had been shipped to Burbank and, with what inventory was already there, was appraised by the receiver in bankruptcy as worth $130,000—exclusive of the good name.

THE writer does not want to fall into a historical pattern in these articles, since history is not their primary intent, but it's still the case that "you can't tell the players without a score card" and, since the pioneering cadre is now to be succeeded by the group which carried Lockheed to its place in national and international significance, we note briefly how certain individuals came into the picture.

First, there were the founding seven—Robert E. Gross, Carl B. Squier, Walter T. Varney, Lloyd C. Stearman, Cyril Chappellet, Thomas Fortune Ryan, III, and R. C. Walker; and contemporaneously, or in short succession thereafter, such as Hall Hibbard, C. L. "Kelly" Johnson, C. A. Barker, Whitley Collins, Dudley Browne, John Canaday, Bert Holloway and a long train of notable figures, executives, engineers, scientists, test pilots, designers and strategists such as would be adequate to staff the total aircraft industry of any but such a major power as the United States. In the slightly more than a quarter of a century since the Gross team paid $40,000 for the name

and assets of Lockheed, almost a half million employees have at one time or another toiled in the ranks, and production has expanded and diversified to the extent that Lockheed and, indeed, the entire aircraft industry, is currently scarcely definable in terms of airpower alone.

It might be appropriate to note here that two clear impressions of Lockheed's growth stand out in the writer's mind, insofar as personnel matters are concerned. One is the unique degree of freedom conferred upon a numerous group of young executives. At any time over the years, I suppose there have been a score of men in various capacities who could commit the company to a critical decision and be backed up in their action. Of course, they subsequently might be fired if the decision was stupid or foolish but the company would not renege on whatever arrangement some authorized individual executive made. The other impression in the manpower area concerned the long stretch of years in which employer-employee relationships at Lockheed were notable as exemplary. Some of the fine quality seems to have been lost of recent times but, in the years of growth from a mere company to a historic national force, that relationship was a tremendous factor of success.

Bob Gross, captain of his hockey team at Harvard, went into the investment banking business with Lee, Higginson & Co. after he graduated in 1919; and knew his way around among the bulls and the bears countrywide by the time Lindbergh flew to Paris and made aviation finance seem something more than a blue sky speculation to a New England banking house.

AMONG the investment possibilities was one in Wichita, Kan., headed by an up-and-coming designer, Lloyd Stearman. Originally, Stearman had teamed up with Walter Beech to evolve the Travel Air, of blessed memory to many of us, and then on his own had designed the Swallow, another honest biplane which got into the air transport picture when Walter Varney organized his airline up in the northwest and bought Swallows to ride the aerial version of the Oregon Trail. Varney knew his airplanes, having been an instructor in WW I along with Eddie Stinson, Clarence Young, Dan Probst and a score of other early birds. The judgment and experience of such as Stearman and Varney was calculated to attract risk capital during the upsurge of enthusiasm subsequent to the Lindbergh flight. Gross investigated Stearman at his plant in Wichita, recommended that Lee, Higginson & Co. put working capital into the business and, when turned down on that score, resigned his investment banking job and himself bought into the Stearman Aircraft Company to the tune of some $25,000, simultaneously assuming chores in both the management and production ends of the business.

At this point Hall Hibbard and Mac Short, two Kansas boys with engineering degrees from M.I.T., walked on stage. They were employees of Stearman when Gross bought into the company.

Not long after his investment in Stearman, Robert Gross and his younger brother, Courtlandt, started a business in New Haven, Conn., the idea being to build and sell flying boats to erstwhile ocean-minded sportsmen of the Atlantic seaboard—an appealing prospect in 1929 when the company was hatched but much less appealing when the financial blizzard really started to blow some months later. The New Haven enterprise incorporated as the Viking Flying Boat Company, had manufacturing rights to a French design, the Schreck flying boat, which proved to need modification. Robert Gross persuaded Stearman to lend him young Hibbard, under whose engineering gentling the French Viking managed to pry loose from the water and a dozen or so were sold. But apparently

Sunnyvale, Calif., plant of Lockheed Missiles and Space Division.

Another plant of Missiles and Space Division at Van Nuys, Calif.

Home of the Lockheed C-130 Hercules, the Georgia Division at Marietta, Ga.

Lockheed has large facilities at the Air Force Test Center, Palmdale, Calif.

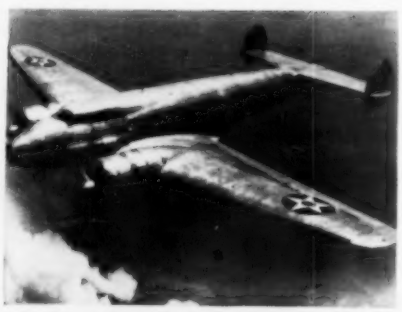
The Georgia Nuclear Laboratories at Dawsonville, Ga., part of Lockheed's Georgia Division.

Scientific laboratories at Palo Alto, Calif., part of Missiles and Space Division.

there wasn't enough Viking in the French model to persuade any number of Ivy Leaguers that it was necessary in their lives and the company closed its doors or docks or whatever it had in 1931. Actually, I guess the Viking wasn't a bad airplane, although I recall hearing someone at Roosevelt Field—either Al Williams or Pete Brooks, if memory serves—tell of landing one in the open ocean off Long Island and being fearful that they had started a tidal wave. Its bottom was a bit flat and its rate of sink maybe a bit hasty.

Robert Gross shortly went to the west coast to join Walter Varney and Lloyd Stearman as a consultant to Varney Speed Lines. Varney was now operating Lockheed Orions between San Francisco and Los Angeles and Stearman was with him. In the meantime the Stearman Company had been merged into another big outfit after the same pattern as the Detroit Aircraft Corporation—United Aircraft and Transport. As originally negotiated,

Some 150 Lockheed 10 Electras were built and sold prior to WWII.



The Lockheed XC-35 was first pressurized cabin plane, won Collier Trophy in 1937 for stratosphere flights.

Thousands of pilots swore by the Lockheed P-38 Lightning, which won fame in WWII.

the deal was a good one for the Stearman-Gross team but the depression robbed all stock of its value. Varney Speed Lines had a good thing of it on the high density run between L. A. and the Golden Gate but Walter Varney thought money was for spending. He knew Robert Gross had other ideas. And, sure enough, Gross got Varney organized and the airline began to roll in clover.

The Orion already seemed too small. "Let's form ourselves a company and build an airplane that suits us," Varney suggested. He knew his airlines, Stearman knew his aerodynamics and Gross knew how to manage and finance. The three formed a company, Stearman-Varney, Inc., and projected the design of their ideal airplane, bringing Hall Hibbard from Wichita to help them. And then affairs took a fateful twist. Detroit Aircraft went into bankruptcy and quit manufacturing Orions. Varney's airline now had no source of aircraft supply. With half an eye anyone can see what would happen—Robert Gross would go to Carl Squier and inquire as to the possibility of buying the Lockheed name and assets, with an eye to reconstituting the company. Squier would note to himself that the prayers of a righteous man availeth much and brief Gross on the potential of the company. And that's the way it was. Varney was interested because he would once more have a source of air transport supply. Lockheed could be bought for $40,000 cash, Squier estimated. And he could gather back the tried and true rank and file which had done such a great job in earning Lockheed planes their reputation.

GROSS raised the money—$20,000 from Varney, $5,000 each from Cyril Chappellet and his wife, and the same from Tommy Ryan and a broker friend, R. C. Walker. Every cent of the financing came from individuals—none from a bank or other institution. It was a product of the faith of individuals who had an unshakable confidence in the destiny of aviation, and who exercised their free enterprise heritage to express their faith. Mr. Walker, a broker, was the only one outside aviation. Cyril Chappellet was a former Army Air Corps officer, ex-Western Air Express pilot, and at this time a California National Guard pilot. (California, by the way, was the first state in the Union to have an air unit in its National Guard. Eugene Ely, the first man ever to land on the deck of a battleship, was one of the original members of that unit.) Tommy Ryan was the power behind Mid-Continent Airlines. And the others of the founding seven we already know about—Gross, Squier, Varney, Stearman—a proven lot of diversified ability was theirs in the aggregate.

It was told around that a skeptical judge, in closing the deal for the assets of Lockheed, expressed the hope to Gross that he wasn't selling him a pig in a poke. The story seems reasonable. I never heard what Gross replied but he was a covered wagon driver at heart and I reckon he probably muttered the equivalent of "Git up, Hoss."

Now, if we are to get anything more out of this reading than a little dusty data, it is time to rear back and make a few pertinent observations.

One of them is that, up to this point, Lockheed's story was a purely grass roots drama. A handful of self-educated youngsters, by the exercise of a little ingenuity and a lot of tenacity, had built and sold a total of only 200 odd airplanes—but thereby had opened up the world like an oyster.

However, this wasn't the important thing. The important thing was that they had built a broad foundation of experience upon which a tall structure might be erected. Few moderns pause to consider that millions of bits of trial and error, of exploratory designing, of purely imaginative creating had to be accomplished before even the rudiments of aeronautical engineering were firmly established. The modern young engineer comes out of school with a shelf of proven data and tomes of applied mathematics. The graduates of Hall Hibbard's time had to prospect for most of this fact by fact, formula by formula, experiment by experiment. Nobody will ever bother to acknowledge the incalculable debt owed to the pioneering aircraft industry of the United States for its midnight oil of patience in learning, but it should be put on record at least this once. Jack Northrop, an acknowledged genius, once said that it took him ten years to learn what a graduate of Northrop Institute presently learns in two years. So, when we note that the Orion crossed the top of the world and penetrated the (*Continued on page* 100)

Kinner-powered Ryan monoplane, popular in the '30s for aerobatics.

give me a Sport plane

By DEREK VAN DYKE

This is not a plea to turn back the clock in aircraft design but rather to fill the need for a modern aerobatic training plane.

The author's Waco UPF-7 with Stolp-Adams conversion.

IN THE MAIL the other day, I received a questionnaire from one of the foremost lightplane manufacturers in the world. This company is attempting to evaluate the market for a light "sports" type aircraft. However, there is a hitch in their questionnaire. They've already decided what they are going to build. Their preconception of sport plane does not appear much different from what is available on the market today. They are not doing anything new.

First of all, last winter, this company hinted via press release, and with attractive artists' conceptions of their craft in flight, that they might go into the production of a "sport type" aircraft. Next, the factory announced that it wanted the public to enter into the spirit of things and tell what it wanted incorporated in the plane. And here is the basic problem. At this point the thoughtful pilot might raise the question, "Do you want me to tell you what I would like, or do you want me to answer the questions which you have prepared and which really give me only the choice of taking what you have already planned or nothing. There is no place to tell you what I want, if I don't agree with your ideas."

It is possible that the prospective sport plane owner might have some very definite ideas of his own as to the purpose of a sport plane. What is sport? For my money sport is the use of an airplane for the pure joy of flying. A sport plane would allow the pilot to do many things which he cannot do in a utility plane. In particular, aerobatics and flights into remote (*Continued on page* 80)

An appraisal of the various types of autopilot systems available to utility aircraft owners—their disadvantages and advantages.

By BASIL DELTOUR

PART II

AUTOMATIC FLIGHT

LAST MONTH we discussed the various individual requirements for automatic control systems, their basic principles and how each manufacturer in his own way has approached the engineering problems involved. This month we will "get down to brass tacks," and examine each of the systems offered to the utility aircraft owner. First, let's take up the various basic systems used.

Tactair is all pneumatic, using exhaust air from the engine-driven vacuum pump to operate bellows as servos. Attitude sensing is accomplished by sensing the airflow that varies as a result of a change in spacing between an air orifice on the gyro case and a cam mounted on the gyro gimbal. Very close tolerances are necessary for proper operation. A small pneumatic "relay," mounted on the servo unit, amplifies this change in flow to release air into the proper side of the servo bellows which produce the amount of control force needed. The unit has the advantage of being entirely independent of the aircraft electrical system. It is also light in weight. However, the total weight is not published since it is assumed that the owner will remove his panel gyros and install those provided by Tactair. Published weight, therefore, does not include the weight of gyros.

Mitchell states the weight of his equipment in the same manner. This system, however, is electronic, and uses an old principle of control electronics for the first time in an autopilot. The principle is to introduce a frequency shift whenever an error occurs. If everything is normal, the frequency is approximately 10 mc. An error in one direction will produce an increase in frequency while error in the other direction will cause a decrease. The frequency shift is proportionate to the degree of error or change from desired attitude. The Mitchell autopilot has a weight comparable to Tactair's and its electronic circuits are completely transistorized.

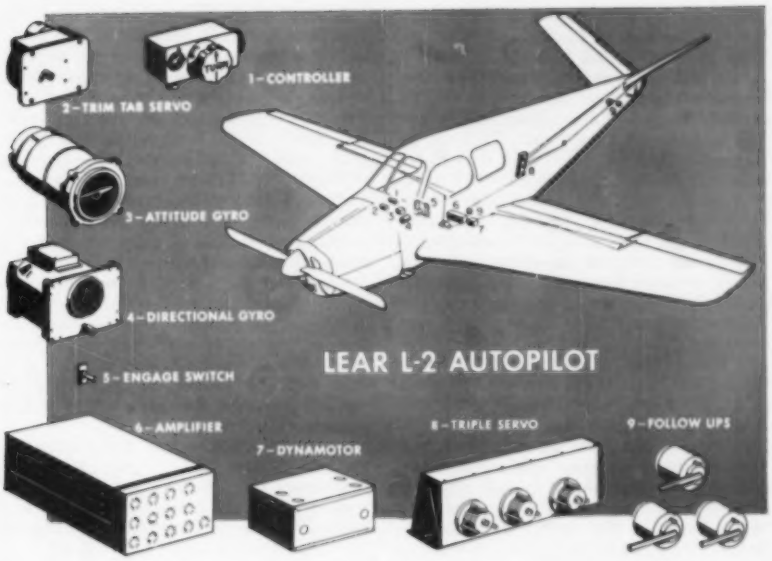
Federal is a mechanical-electrical autopilot and the only one that is completely self-contained. The gyro horizon and servos, with the attendant relays, are mounted as a single unit which is necessary because of the mechanical principles involved. The presently mounted panel gyro instruments are not replaced. An attitude displacement is sensed by electrical contacts on the gyro that operate electrical relays which in turn energize the servo motors. To obtain "follow up," the movement of the servo shaft, operating through a cam and cable arrangement, opens the contacts and stops the servo at the correct point. The weight of the Federal autopilot is at least twice that of Tactair or Mitchell; however, there are certain features of this unit that cannot be obtained without additional weight.

Lear's L-2 autopilot employs the same principles as those in military and airline equipment. The basic system uses a 400-cycle AC signal, modified in voltage and phase to produce the error signals. Unlike the previously mentioned two-axis autopilots, the L-2 is a full three-axis one, employs rate circuits for damping and is entirely electronic. Its weight is highest of the four we are dealing with. Lear, of course, provides more features than the others for the additional weight but not without considerable additional cost. It is the most expensive of all the autopilots for light aircraft, priced at about $4,500 installed as compared with Mitchell, Federal and Tactair installed prices of around $2,800. Because of the wide differences in characteristics and cost, the Lear L-2 should not be compared with the lower priced three and yet it would be a disservice not to include a discussion of it in this article.

From the foregoing you can readily see that no two manufacturers chose to use the same system. Therefore, their basic units and accessories are not interchangeable. Each has its advantages and disadvantages. I can only point them out and let you select for yourself.

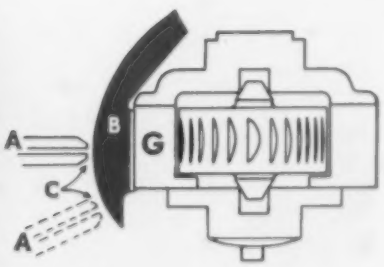
From flight tests it was determined that Tactair has the most flexible system for heading control of the low priced three. This undoubtedly accounts for its success. With course selector card atop the regular directional gyro card, you can dial in any desired heading with the *course* knob. The 'Heading Lock' remembers the heading no matter what you do with the autopilot or the airplane and as long as the *course* knob is not touched, the plane will

The Piper Autopilot Control as installed in an Aztec.



Lear L-2 Autopilot component parts.

CONTROL SYSTEMS



Left: Typical installation of Tactair pneumatic autopilot in Beechcraft Bonanza. Above: This simplified cutaway diagram shows how air gauge (A) and cams are mounted in gyro instruments. Precision-designed cam (B) varies amount of air gap (C) at suction gauge orifice, creating instant indication of slightest change of attitude. Note, however, that there is no physical contact with gyro elements (G) such as is necessary with electrical systems.

stay within 80 degrees of the selected heading. When you release the controls or re-engage the autopilot, it will go back to the original heading. It will fly the reciprocal heading as well as the selected one which is a help in a holding pattern if there isn't much wind.

Mitchell's heading system is equally accurate but will maintain the heading only on the '0' mark of the gyro. Like the Tactair it will remember the heading within 80 degrees and come back to it no matter what you do to the airplane or autopilot, providing that you do not cage the gyro or rotate it to a new position. The '0' setting being mandatory could prove cumbersome for an IFR pilot but is probably satisfactory for the VFR pilot. Mitchell has recently introduced a heading selection system which has the compass card printed on a rotating dial mounted around the DG face. Pilot operation is very much like the Tactair heading lock. It will cost you another 400 clams, too.

Federal uses a rate gyro (Turn and Bank Indicator) for heading control and the method here is to turn to the desired heading and center the knob. The heading must then be monitored and, if any drift is noticed, the course trim knob adjusted to stop the drift, then return to the desired heading is made with the turn knob. For short term heading control, this is excellent because it is not necessary to dial in any headings. For long term control it might not be as satisfactory as a DG.

Lear combines the accurate heading control of Mitchell and Tactair and the ease of operation of the Federal. All that is necessary is that the airplane be turned with the turn knob to the desired heading. The autopilot will hold the aircraft on whatever heading is under the lubber line at the time the turn knob is reset into the center detent. It will remember the heading if the autopilot is overridden (which is not too easy) but not if the

turn knob is used. Thus it does not have the full memory of Tactair and Mitchell. Lear has a powerful and highly responsive system and you don't move the control knobs faster than you want to change attitude because the airplane will follow the control as if hand-flown. This can be uncomfortable for pilot and passengers alike. Because of the rate circuitry used, it does the best job of holding attitude in rough air. The controls act a lot quicker and in just the right amount to put things back on an even keel in a hurry. Federal has an equally powerful system but it is not as responsive as the Lear. The reaction is very smooth yet somehow positive and you never have the feeling that it is working too hard for the structure of the airplane. Mitchell is a little less powerful than the Federal and the response, particularly in pitch, is slower, resulting in a somewhat less steady ride in rough air and a little more difficulty in establishing a pitch attitude. Tactair is quite responsive but lacks the servo force of the electrical models so will not make rapid corrections if the displacement is large.

One of the reasons that the Lear L-2 has a higher weight and price is the inclusion of their excellent automatic trim system. Any time that an attitude change is called for, by moving the pitch knob on the control box, the aircraft trim system will automatically follow so that the airplane is always in trim no matter what the setting of the autopilot in pitch. A change in power setting that would normally call for a trim change to maintain attitude will result in an automatic trim adjustment. If the De Luxe controller is installed, the autopilot pitch command will always be synchronized with the position of the elevator controls so there will be no pitch up or pitch down when the autopilot is engaged. These automatic trim features are not found in the three lower cost units.

Because of the low servo forces of the Tactair it is easy to override at any time, so if the pitch command and the aircraft attitude do not coincide at engagement it does not present any serious problem. You just hold against the autopilot with one hand while readjusting the pitch knob with the other until the force is relieved. A full down command at cruising speed will momentarily result in a smooth entry to a steep dive of about seven degrees. But in a few seconds the airspeed will build up to where the trim overpowers the autopilot and the nose starts to come up so the red line speed of the airplane will never be reached. Consequently it is necessary to readjust trim for any major changes in pitch attitude with the Tactair. A little less convenient perhaps, but certainly a safety consideration.

Mitchell will override pitch trim for the most part. The aircraft trim will overpower the autopilot only at the extremes where the autopilot command and control trim settings are widely different. It is therefore possible to fly the airplane with the autopilot through most of the configurations without readjusting trim. Of course, it is sensible to be sure the airplane is trimmed at cruising so that you maintain the best performance. It is also a good idea to check the setting of the autopilot before engagement and the aircraft trim before disengagement to prevent any annoying pitch changes. The sudden and sometimes violent attitude changes that occur when engaging the autopilot are often very frightening. Unless close to the ground, there is little danger because the airplane cannot exceed an attitude of ten degrees either way due to the limiting factors built into the autopilot. If the autopilot is not engaged below 300 feet, there will be plenty of room and time to make corrections. I doubt that any autopilot will produce loads in excess of plus three Gs and minus one G.

After establishing proper compass course on a cross-country flight, directional gyro is set to zero and control knob is pulled out, engaging heading lock. Plane will hold exact course indefinitely.

Federal, being a powerful autopilot, handles the larger airplanes with ease, but it does not incorporate automatic pitch trim features and for comfort should not be turned off or on without checking the settings of pitch control or aircraft trim. Of the low-cost three, it seems to do the best job in maintaining attitude of the airplane when flaps or landing gear are lowered.

An autopilot is like any other thing that you add to an airplane. To use it properly, you have to set up a system of procedures before getting the most pleasure from it. Part of the procedure is to check relation between attitude and aircraft trim and control settings.

All the low cost units are ready to go when you are and require no warm-up period. With the Federal autopilot it is necessary to have the master switch on shortly after the engine is started. The gyro erection is dependent on a small trim motor in the gyro-servo unit that uses little power but does not operate when the master is off. The Lear must be turned on with the master switch about a minute and a half before it can be used, since it employs vacuum tubes which require a warm-up period. For stability in rough air I will select Lear, Federal, Mitchell and Tactair in that order and you'll notice this bears direct relationship to the amount of servo power available. All of them do an adequate job in rough air. The Tactair will never produce loads greater than plus or minus one G, regardless of the extent of command change in smooth air and I doubt it would add any more than that in turbulence. One thing you can be sure of. If you slow your airplane to its safe maneuvering speed in rough air, as when flying manually, the autopilot will not induce any severe loads. If you don't know the safe maneuvering speed of your plane, I suggest you find out now, whether you have an autopilot or not.

Lear, the only presently available three-axis system, does a terrific job of damping out the yaw oscillations in an airplane like the Bonanza because of the incorporation of the rudder channel and separate rudder servo. You won't achieve this degree of damping with any of the three lower cost units although they do contribute some damping. This is because these systems control heading through the ailerons and do not control rudder except through a spring type interconnection of controls such as on the Bonanza and TriPacer. Federal does supply a unit with a rudder servo but not for the Bonanza and it operates only in conjunction with the aileron servo to provide coordination on entry and recovery from turns.

Lear, Tactair and Federal all group their controls at a single point in a control box assembly that can be located anywhere on the pedestal or instrument panel within reach of the pilot. They all follow the same general layout. Mitchell, on the other hand, has placed his controls next to the instruments to which they are related. The turn control next to the Directional Gyro and the pitch control next to the horizon. The engagement con-

(Continued on page 94)

By FRANK C. BEESON

Originally designed as a farm service building this, easy to build, structure is ideally suited for airplane storage.

DO-IT-YOURSELF HANGAR

IF YOU ARE thinking of building a hangar, here is an idea that will interest you.

Arnold Schaefer, Jr., a flying farmer from the Peach Ridge country north of Grand Rapids, Mich., ran across it a couple of years ago while touring Canada. It is called, rigid frame construction.

This relatively new technique seems to be made to order for aircraft, being post free, inexpensive and lends itself readily to "do it yourself" construction.

The rigid frame is essentially an arch made by connecting four straight pieces of structural lumber with nailed fir plywood gussets to form a load carrying unit. A number of these form the skeleton of the hangar which is then covered with a skin of four- by eight-foot plywood panels. (This construction method depends on the inherent two-way strength of plywood for its structural stability.) Schaefer built his 47 by 72-foot hangar with a crew of six farm laborers in five working days. The building was erected at a material cost of 70 cents per square foot and, while figures on labor costs have not been kept, even by adding a reasonable allowance for unskilled labor, the total cost will be well below that of a lowest conventional type construction, a saving both in time and money.

Above: View of finished hangar. Below: Interior showing the gusseted framework which is the secret of the structure's rigidity.

Rigid frame sections, made up of gusseted two by tens, were set up on a concrete foundation. The entire structure: roof, side and end walls, was covered with ⅜-inch A-C Exterior fir plywood. Edges were lapped and vertical joints caulked. It was then painted with an aluminum asbestos fiber roof coating.

"The building doesn't leak a drop," Schaefer says, "and as for strength, it stood up under the heavy snows of 1959, probably the worst winter we have had in 50 years, and we have some corkers."

On the open end of the hangar, 11-foot square door sections are suspended on metal framing which extends past the edge of the building, giving it a total access.

Five planes, four Stearmans and a Piper Cub, are stored in the hangar and there is plenty of room to spare. Arnold Schaefer, together with his brother Caryl, operates a commercial dusting and spraying outfit serving the Michigan apple district called Aerocrop Service. Plans for rigid frame construction are available, without cost, from Douglas Fir Plywood Association, Tacoma, Wash. END

FORECAST: THE CESSNA 407

THERE, in the dimness of the big hangar, she stood in her pristine beauty—low, long and sleek. Bob Hagan, Chief of Military Division, Flight Test, walked to the big cabin door just ahead of the engine intake and swung it open. Within was an elegant expanse of cream colored headlining and dark blue upholstery. You knew those seats were comfortable before you set foot in the cabin. And setting foot in the 407 is easy. The floor is only one step from the ground.

Since the cabin is pressurized to maintain 8,000 at 35,000 feet, outside openings have been kept at a minimum—thus no outside baggage loading door. With the baggage compartment at the rear of the back seats, loading is contrived by hinging the seat backs to fold forward. Pilot seats adjust fore and aft and the backs tilt to three different positions. Rudders also adjust fore and aft. Pilots of any size or shape can find combinations for maximum comfort, easy reach of controls and clear reading of instruments.

Full flight instruments are set in the center panel for easy accessibility to either pilot. On the far left is a readout panel—12 warning lights for oil pressures, generators, tip tanks, fuel boost, gravity feed, hydraulic pressure, etc. Atop the main panel is a master caution light. "On" is warning to check the readout panel which indicates just what is malfunctioning. Many automotive writers decry the omission of instruments in favor of warning lights. I asked Hagan if he felt the same way. He replied, "If a component goes wrong, there's only one course of action. Turn it off. I can't see any particular advantage to an instrument." One feature seems strange. The center pedestal has only the throttles—no prop controls, no mixture controls. It looks mighty thin and barren to anyone accustomed to a standard twin-engine pedestal.

On the wheel are three buttons. One activates the electric elevator trim tab, another the radio transmitter, and the third engages the hydraulic nosewheel steering mechanism.

On a ledge below the left window are the lighting controls, including bright lights for emergency in thunderstorms and red lights for night. The lower left side panel is a solid mass of breakers, 65 in all, easily accessible at

Mockup of the Cessna 407 is most realistic.

Bob Hagan, Chief of Flight Test, Military Division (far left), and author about to flight check the Cessna 407 by proxy in Air Force T-37B.

any time. The airplane is completely self-sufficient—no need for battery carts or other outside help.

Two 1,400-pound thrust engines will give this 9,300-pound gross weight airplane a sea level climb-out of 3,680 fpm, a speed up to 404 knots (465 mph) at 35,000 feet with a maximum range of around 1,500 miles.

I could hardly wait to get to the business of flying this beauty. There was only one drawback. The Cessna 407, at this point, is only a mockup but so well done that it's hard to believe the plane isn't ready to roll. Hagan laughed as he told me of the public showing in Washington. "A lot of people asked where we flew from and what our flight time had been."

As I bemoaned the fact that I couldn't fly, he assured me, "We've done enough engineering to know that it will handle very much like the T-37B. Everything is similar except the cabin section and the engines. The nacelles have been moved out nine inches to keep from infringing on cabin space. And, of course, the cabin section is larger to accommodate four passengers and baggage. Performance will be better because thrust will be up about 400 pounds per engine and the entire configuration will be cleaner.

"To get an idea how the 407 will fly, we'll take a hop in the T-37B." With that we took off for the pilot's room where I was outfitted with flying suit, hard hat and chute. There is no likeness between getting into the 407 and the T-37B. Entering the former is as easy as stepping into your automobile but getting settled in the latter is a major operation, at least for the first time.

In the interest of saving time, Bob didn't bother to check me out on the various systems. That indoctrination requires considerable study and has no particular place in this story. He did show me how to pull the ejection handle for bail-out, indicated the throttles, the electric trim tabs, speed brakes; and fired up the two Continental J69-T-25 jets which now produce 1,025 pounds thrust each as compared to 920 each in the "A" model.

As we moved off the ramp, Bob indicated for me to take over the taxiing. Caught by (*Continued on page 84*)

A "check pilot report" on a proposed four-place executive jet.

By NORMAN JACOBSHAGEN

Left: Wide door and low floor level make it easy to enter roomy interior of 407. Right: The T-37B has 1,025 pounds of thrust per engine.

Convair C-131A Samaritans carry armed forces sick and injured to over 350 military hospitals.

By LOU DAVIS

Airborne Samaritans

THE EIGHT-DAY-OLD INFANT stopped breathing. While its young mother watched anxiously, the flight nurse gave artificial respiration, and the tiny heart started pumping life-sustaining blood again.

This dramatic moment took place in the sky, aboard a Military Air Transport Command Aero Medical Evacuation hospital plane. The nurse was First Lt. Rose Ann Gardella; and the infant was being flown with its parents from Fort Knox to Lackland Air Force Base, Tex., for special treatment.

Lieutenant Gardella said, "This is the kind of incident that makes my job one of the most satisfying in the Air Force. When we finish a flight, and my patients are all safely in the hands of medical specialists, I know that I've helped make the day brighter and more comfortable for them."

This expression of being needed is voiced by all members of Aero Medical Service flight crews who, every nine minutes, make a landing or take-off somewhere in the free world to load or unload the sick, injured and convalescing of the nation's armed forces. Good Samaritan planes and crews provide the vital lifeline of rapid, adequate en route medical care for an estimated military family of ten-million people, including dependents, who stand duty in the Arctic, in Europe, the Middle East, South America, the Far East and the Pacific islands.

An outstanding military doctor, Maj. Gen. Elbert DeCoursey, commanding officer of the U. S. Army's Medical Field Service School at Fort Sam Houston, Tex., compared the MATS-directed aero ambulance service to an artery for the flow of medical knowledge that is accelerating civilian and military medical progress all over the w rld.

General DeCoursey says "There (*Continued o page* 106)

Every nine minutes, somewhere in the free world, a MATS Aero-Medical Samaritan lands or takes off on its mission as the mercy lifeline for our armed forces family of ten million.

Nancy Lee Clark, 2, enjoys flight to hospital.

Lt. Rose Ann Gardella, flight nurse, ministers to PFC Peter Fanning on airlift from Germany.

Ambulatory patients, Army Pvt. Louis Demas, M/Sgt Myrwin White and T/Sgt Martin Wayne.

Mrs. Henry L. Hudson, wife of SAC W/O, a heart patient, finds travel easy this way.

Interior of MATS Samaritan transport in flight.

THE PRO'S NEST

A preventive maintenance program for lightplanes pays off in savings on upkeep and provides much personal satisfaction.

MAINTENANCE TIPS FOR PRIVATE OWNER

By TED DUROSKO

BY A LITTLE day-to-day checking and instituting of repairs before wears and tears become full-fledged jobs for a shop, a preventive maintenance program can save money for an aircraft owner; and more importantly uphold the safety factor. Some private pilots have adopted this practice; however, many owners feel that maintenance is too technical—away beyond them.

This need not be the case. A close look at aircraft preventive maintenance will reveal that a good portion of it is within the average pilot's mechanical aptitude.

Guided by an owner's handbook to cover his particular aircraft, a copy of FAA Manual 18 (Maintenance and Repair), common sense, as well as some of the tips given here, the private pilot can, by periodic inspections and remedial action, nip many maintenance bills in the bud.

If repairs are to be made, the cost can be lowered considerably by the owner conferring with an A&P and determining the extent and nature of the repairs; then performing the simpler portion of the basic labor under the supervision of the licensed mechanic. The job is then inspected by the mechanic who, if satisfied, makes the proper entry in the log book and signs for the work.

Another advantage of the preventive maintenance plan is that it can be practiced at convenient times. For instance, when the weather is poor for flying, the pilot-owner can bring out the wiping cloth, pliers, screwdriver, safety wire and a few wrenches and spend an hour or two checking his aircraft.

What should be inspected? For a guide to get started, here are the major places where most maintenance problems breed:

• *Wooden propeller*—This is a logical point to start since trouble here can be twofold. First, the prop itself can begin to come apart, and second, its off-balance condition can cause excessive wear on the engine and possibly crack an engine mount.

Check the prop for large nicks, separation of the laminations, looseness of hub bolts, and for wobble on the shaft. The finish of a wooden prop also should be checked. If the surface is scratched and nicked, it should be redone. An A&P can accomplish this locally by sanding the prop with a fine grade sandpaper and then applying an even coat of good grade clear varnish.

Another tip for users of wooden props is to make certain that the prop is left horizontal when the airplane is hangared or tied down after flying. In such a position, both blades receive the same amount of any moisture which may be present in the air. If the prop is left regularly in a vertical position, one blade will receive more moisture than the other and an off-balance condition may result.

• *Metal propeller*—Metal props are not affected by moisture. However, they can become unbalanced by accumulation of foreign matter on the leading edge. Periodically, metal props should be washed with an aviation type cleaner or thinner and carefully dried with a soft cloth.

Inspect the leading edge of metal blades for nicks. If they exist, an A&P can file out the sharpness and yet remove very little of the metal. Should nicks be large and it appears that balance might be changed, return the prop to the factory for reconditioning.

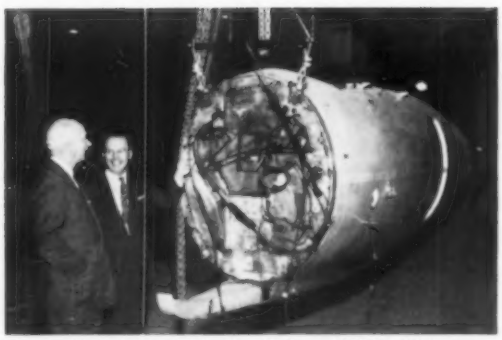
Incidentally, in the case of constant speed propellers, as found on some light aircraft, it is especially desirable to place them in a horizontal position when the airplane is parked. It not only prevents (*Continued on page* 115)

Checking the brace wire on the empennage for proper trim.

A recognized authority on historic aircraft, the National Air Museum of the Smithsonian Institution operates a unique

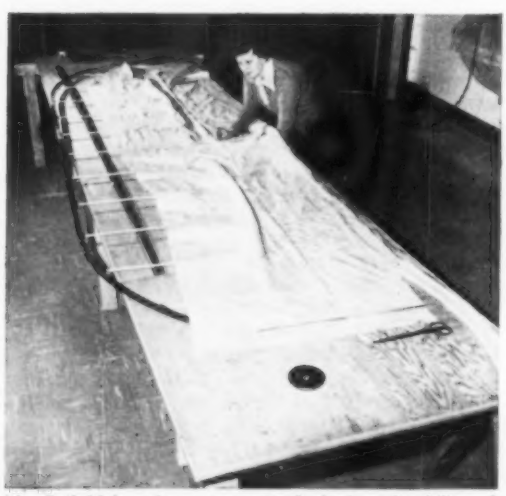
ANTIQUE AIRCRAFT FACTORY

By JOHN MITCHELL



Museum Director P. S. Hopkins (left) and Walter Male, curator, inspect fuselage of Wiley Post's globe-circling Winnie Mae.

Prize possession of the National Air Museum is the first turbojet engine. Sherman Lager dismantles part of the Whittle jet.



Mrs. Ruth Male makes new covering for horizontal stabilizer of the Vin Fiz, which was the first aircraft to fly across the U. S.

AVIATION *aficionados*, bewildered by today's swift-moving, revolutionary manufacturing techniques for space capsules and Mach 3 bombers, would find a quiet oasis in a unique aircraft factory operated by the National Air Museum of the Smithsonian Institution.

The varied products of the plant—officially known as the Air Museum's Preservation and Restoration Facility—are the Winnie Mae, the Vin Fiz, Jennies, Liberty and Curtiss OX-5 engines and even altitude balloon gondolas which are being completely restored for exhibition. The planes produced by the factory are unique in another respect: None of them ever fly.

Located across the District of Columbia line at Silver Hill, Md., the facility occupies 14 sheet metal "Butler" buildings in which are stored about 100 historic aircraft and 300 engines. There are countless accessories such as landing gears, instruments and wheels. In addition, the Navy has 40 aircraft stored for the museum at Norfolk, Va., and the Air Force is keeping four aircraft at nearby Andrews Air Force Base, including the Enola Gay, the B-29 which dropped the atomic bomb on Hiroshima. The factory itself occupies two Butler buildings joined together.

Among the aircraft and engines in various stages of restoration are: The Whittle turbojet, the first jet engine built in England; the NC-4, first plane to cross the Atlantic; the No. 1 Liberty engine; first DC-3 used by Eastern Air Lines, donated to the Museum by Capt. Eddie Rickenbacker; a variety of Fokkers, Heinkels and Focke-Wulfs; the Douglas Cruiser, the Chicago, which flew around the world; and Al Williams' aerobatic plane, the Gulf Hawk.

At the present time, 12 highly skilled aircraft mechanics, some with more than 30 years experience, assisted by several mechanics on loan from the Air Force, are carefully restoring these invaluable aircraft and engines, the legacy of the world's air pioneers.

Extreme care is used to duplicate exactly the original parts of aircraft and engines. (*Continued on page* 120)

Above: Just 28 seconds after the 9,800-pound Beech broke ground, "lost an engine," and developed rocket thrust, it had reached 500 feet altitude. Below: Harp Wild briefs the author on jato control panel mounted above center window in Super 18. Bottom: Loading 42-pound Junior Jato unit in special engine nacelle modification.

In light twins, compensation for loss of primary power or augmentation of available power at a critical time can be supplied by "Junior Jato."

By TED DUROSKO

JATO FOR BEECH SUPER 18

WHETHER A PILOT flies for the military, airlines or for a private company, he probably has met a situation where more power was desired than that delivered by the engines of his aircraft. Take the instance when one engine of a twin goes sour on take-off; when an aircraft becomes loaded with ice and struggles for altitude; when a strong down-draft takes over in a mountain area; when a pilot is faced with a full gross take-off from a high altitude field in the heat of summer.

First to receive assistance when faced with such problems were the military pilots when jato bottles were introduced. Later jato bottles were used on transports and a number of airlines found that the aircraft rocket engine could be depended upon to meet most emergency situations.

Just recently a smaller version of the jato bottle became available for light twins, and business aircraft operators began to take a close look at this trend of carrying standby power. One such company, Packaging Corporation of America (Ohio Boxboard Division) of Rittman, Ohio, became interested in the rocket standby engine from the standpoint of flight safety and had the "Junior Jato" installed on their Beech Super 18.

The installation was in progress at Aircraft Service, Inc. at Cleveland-Hopkins when I first saw Packaging Corporation's Twin Beech. I had dropped into Aircraft Service that morning to pick up some items for my airplane and, while walking through the hangar, saw sales manager, Paul Schneider, talking to a maintenance crew perched on the wing of the Beech. In answer to my query, he explained that they were installing Junior Jato on the ship.

Schneider then introduced me to Harp Wild, pilot for Packaging Corporation of America. I explained to Harp that I had experience with jato on larger aircraft and was quite interested to see how it would work out on the light twins. Wild was eager to talk on the subject and described the installation in detail and pointed out that each Junior Jato bottle had a rated thrust of 250 pounds for 15 seconds. This is comparable to 100 hp at 100 mph.

The bottles are six inches in diameter and 26.75 inches long. Weight, when loaded, is 42 pounds each; empty, they weigh 21 pounds each. They may be operated or stored at temperatures ranging (*Continued on page* 74)

"... the famous Tempelhof 'slot' ... over the cemetery between the apartment houses ..."

Storm over the corridor

A firsthand account of the progress of a scheduled airliner threading its way through the narrow airlanes leading into Berlin from West Germany.

By MARIUS LODEESEN
Captain, PanAm

THUNDERCLOUDS loom on the horizon in the direction of Berlin, directly on our airliner's course, promising our passengers a thorough shaking-up if we fly into it. Yet, we are in the "Corridor" across Communist East Germany and we have to stay in it. That leaves us only ten miles to maneuver on either side of the center line.

That is the routine situation faced by the pilots of the airliners which fly day and night into Berlin from West Germany. Only three corridors are available for this service. The flight plans of these aircrafts must be submitted to regular airway control and to the Berlin Air Safety Center. How is it possible for us to stay within the boundaries of these narrow airlines at prescribed altitudes and still avoid severe weather disturbances?

Not so difficult in most cases. Come along with us on a typical flight and judge for yourselves.

Our Clipper has taken off from Frankfurt with a flight plan to Berlin, via Fulda and Dessau, altitude 9,000 feet. The weather office has forecast isolated thunderstorms on our proposed track.

By the time we reach 9,000 feet we are over Fulda radio range station and we sign off with Frankfurt Airway Control. Now we call a ground radar station located some 50 miles to the North. Meanwhile, we position ourselves on the center line of the southern corridor, which we will enter a few miles southwest of Eisenach, the city of Martin Luther.

A radio beam is directed right through the middle of the corridor to Dessau where it is met by a similar beam transmitted from Berlin. On our instrument panel this beam actuates a vertical needle of a cross pointer. When we are drifting off to the left, for instance, this shows instantly as a movement of the needle indicating to us to fly to the right.

By listening to the identification signals of this beam, we can make sure we are tuned to the right station. Tuning the right station is always important, but assumes particular urgency here.

We now call the radar station and hear: "Pan Am Clipper 664, this is Gunpost. I have you coming on course, 99 miles from Koennern Intersection. There is a thunderstorm directly on your course ten miles in front of you. Do you want me to steer you around?" (*Continued on page* 113)

AWAKENING THE MARKET

AIRCRAFT and accounting machines have one thing in common: both are necessary to most businesses of significant size.

Aircraft, however, suffer mistreatments not normally accorded data processing equipment. Chief of these indignities is in the selling approach and follow-through.

Would IBM be a giant if it operated in the same manner? IBM is obviously customer-oriented throughout its organization, in all policies, and activities, from inception of an idea and on through design, production, sales and service. Everything is based upon exact knowledge of customer needs determined by continuously working on the problems of customers and potential customers. IBM's machines are designed to serve known business needs, *and its salesmen speak the language of profit-minded executives.* The company's data processing experts apply their knowledge of business—not just their knowledge of machines—in surveying a potential customer's need. And they express their findings in terms which any businessman can relate without excessive interpretation to his everyday problems. After making a sale, they help the customer plan his installation, find and train operators, and mesh the machine beneficially into appropriate procedures of management. They precisely fit business tools to specific business needs which they understand as well as

The follow-through after sale in servicing and utilizing the business aircraft is the key to its growth.

By C. GLEN WILLIAMSON
Vice president, Marketing Dynamics, Inc.

The author

the customer; and they make sure that their specialized tools are used to the best advantage of the customer.

Manufacturers of business aircraft can apply those principles if they want to, and the one which does it first will become the giant of the business aviation industry. The potential demand for business aircraft is far greater, in proportion to production capacity, than the like demand for business machines. Although business aircraft sales have grown at an increasing rate over a number of years, the 28,000 odd corporate aircraft now in use are but a drop in the bucket in comparison to the number which could be beneficially in use, *if* they were available, and *if* they were *sold* properly as legitimate business tools. There should be ten times as many companies using aircraft as are so doing.

If this figure causes raised eyebrows, let us hasten to add that it is conservative. During a six-year program of investigation of the corporate aircraft market, executives in numerous companies have been interviewed in a planned effort to find out what their attitudes are toward business flying; and why they feel as they do. A vast majority of these companies did not use business aircraft, and most executives contacted in non-using companies were generally of the opinion that aircraft are an expensive luxury, serving no direct business need. Only a few thought that aircraft were too dangerous. Practically all lacked understanding of what benefits they might receive from proper use of corporate aircraft; and there was little if any understanding of what is meant by "proper use" of aircraft. A surprising number expressed a forlorn desire to try aircraft, but cited their ignorance of how to choose the right types, and set up sound operations, as their main reason for not buying aircraft.

EVEN in companies having one or more aircraft, some senior executives are extremely dissatisfied with results, and further investigation frequently disclosed ample grounds for dissatisfaction. In some instances, operations were fairly good, but the bases of appraisal were faulty. In other dissatisfied companies, the types or sizes of aircraft did not fit the needs, while in nearly all cases where dissatisfaction was expressed, a major portion of the blame rested either on a lack of sound policies and procedures pertaining to business flying, or on a failure to recognize the nature of benefits received. Regardless of the cause, however, user-dissatisfaction is harmful to the whole industry, and it should be a prime concern of each manufacturer of business aircraft.

The Vice President and General Manager of the Chicago division of a very large corporation expressed a violent antipathy for business aircraft. He acquired his attitude while watching how the head office used the five or six airplanes owned by the company. He saw no benefit whatever. When he eventually would listen and learned of the misuse involved and was briefed on proper utilization he became an ardent proponent.

In another worldwide company, one owning a single plane, the president, who was the principal user, expressed serious doubt about justification for even the one airplane. Yet each of his many divisions serves numerous industrial customers who can be reached best by business aircraft. His need for additional airplanes was obvious. He did not see it initially, because he did not initially recognize the need for specific policies and procedures to get real benefit from an aircraft.

SIX years ago, a multi-plant company with headquarters near Chicago received the "full treatment" advocated in this article, and the company was convinced sufficiently to buy one single-engine airplane "as an experiment." The process had included a survey of the company's need for business aircraft, recommendations as to the most suitable kinds, and preparation of material for convincing the Board of Directors. Meanwhile, some executives, engineers and salesmen who would be expected to use company aircraft had to be educated on the safety and utility of the proposed operation. Finally, after the pilot was hired and the airplane was received, the last bit of selling was successfully completed with respect to some of the wives who had expressed various degrees of concern about their husbands' having to ride in the airplane. Everyone certainly thought that would be the last hurdle, only to be startled when a delegation of employees called on the president to object to management's getting extravagant with profits which should go into their well-established profit-sharing trust.

This surprising opposition was then met by a planned program of discussions and articles published in the company's monthly magazine, the program being designed to present all facts and figures of the operation, plus actual examples showing how the airplane really increased the profits available for assignment to the profit-sharing trust. One actual incident described involved three sales-engineers who took off from near Chicago in the company plane early one morning, made successful calls on three O.E.M. customers in southern Illinois and Indiana, and arrived back at their base before dark the same day. It happened that these same three men had made exactly the same calls together, by car, just a few months before. That trip took over four working days. The theme of the explanation published in the company magazine was built around obvious premise that the company with the airplane could now serve several times as many customers, and presumably realize several times as much profit, and the company could handle this additional business without paying the $40,000 or more in salaries to extra men who would have to be hired for expanding the business without the airplane. No further objections were heard, and the company now has a small "fleet" which is still growing.

One of the stumblingblocks encountered by those trying to define benefits of business flying from the inclination to try to make every case show as direct a return as that in the preceding illustration. That is not always possible but there is still no need to fall back on the stock claim about executive time saved. As understanding of business processes and management requirements makes it rela-

tively easy to find plenty of specific and convincing illustrations in almost any company without relying solely on dollar-for-dollar examples or on the sometimes nebulous factor of executive time saved.

THE prospect, before "education", will almost invariably create that stumblingblock because he always thinks in terms of dollars of cost versus dollars earned, and the salesman then falls into a box by relying on direct rebuttal in the same terms. In the interviews mentioned, some executives, leaning toward the view that aircraft are luxuries, have cited the fact that business aircraft do not earn profits like production tools. Others have pointed to claims that an existing operation costs more than the same travel by public transportation. Although it is easy to take the wind out of both assertions, it is always a mistake to let that be the main effort.

Concerning alleged excess costs of a particular flying operation, it is safest first to take a good look at policies, procedures, load factors and accounting practices before attempting refutation. The claim of high cost may be correct, but not always. In several instances investigated, the business flying costs were entirely out of reason in relation to tangible benefits being received. In other operations, including one recently examined, mere casual investigations disclosed that the extra out-of-pocket expenses actually incurred in using public transportation (hotels, taxis, meals, etc.), expenses which had been left out of the company's figures, made all the difference necessary to attain a better balance. The point was merely cited without being stressed. Neither was any extra stress given to the considerable time saved by executives and others when they used the company aircraft. The facts were cited, but only as a part of a non-defensive presentation from a broader viewpoint.

An investigation before argument is always advisable, but even then, it is unwise to fall into the trap of defending aircraft on a dollar-for-dollar basis. It is often possible to make clear case on that dollar basis, and the opportunity to do so soundly should never be missed; but it is always possible to show business aircraft in a different light where they do not have to compete directly but unnaturally with production tools or commercial transportation. One such way is to point out that most modern department stores have escalators costing many thousands of dollars and that some of them are installed practically alongside ordinary stairs which cost but a fraction as much. The expensive escalator never earns a penny, yet any businessman can readily see its value. He will see the merits of analogies similarly relating to aircraft use. That is only one example, but since it is universally applicable, it should be sufficient to illustrate a technique for showing business flying benefits on a positive basis rather than defensively.

Businessmen in literally thousands of companies need only to be shown facts of business flying *in terms directly applicable to their businesses* before cost of them become willing prospects. Many would actually go shopping for aircraft at that point, but all of them, as well as the business aircraft industry, could benefit from still further advice. They do not know how to choose the right aircraft to serve their needs. Their varied concepts of pilots as a whole, and of how to select the right ones for their purposes, leave much to be desired. Most of them have absolutely no understanding of the special corporate policies, procedures and other matters essential to safe and productive use of aircraft. Some recognize that they need help, but all need more help than they realize and much more than is generally given at present by any source of business aircraft.

Rewards for thinking and acting on those matters are not limited to aircraft manufacturers and their dealers. While new aircraft will account for the bulk of sales in the visualized expansion, some considerable share of the market will always be served by vendors of used aircraft. Such vendors have the same opportunity to increase their sales by helping the purchaser. Their potential customers are the same as those of the manufacturers, and the used aircraft dealers have the same obstacles to overcome in the corporate market. They also have an additional hurdle in that most non-aviation executives visualize the purchase of used aircraft as being the same type of gamble as is involved in buying a used car. Many think that buying a used airplane is an even bigger and more dangerous gamble. Few know anything about government regulations pertaining to inspection, maintenance and overhaul of aircraft and engines; or presume that such regulations pertain only to airline aircraft. They have no concept of the meaning of "progressive maintenance". They know that pilots must take tests and maintain licenses, but are not aware that mechanics are similarly tested and licensed and must certify to work they perform. Since this faulty concept of secondhand aircraft has often prevented sales in spite of a sometimes very large price advantage, the vendor of used aircraft must correct the misconceptions in addition to providing many of the services recommended in the customer-orientation program for manufacturers.

Of course no aircraft manufacturer or vendor can be fully objective in providing the needed help, particularly in the appraisal of a particular customer's needs; but neither can the manufacturer of business machines. When IBM makes a survey of the data processing needs of a potential customer, it is inconceivable that the report will recommend competitive equipment (which certainly may be very good), but that does not prevent IBM from doing a good job, particularly on the remainder of the assistance given their customers. Aircraft manufacturers can similarly do a great service to prospects, and to themselves, by providing all assistance possible in spite of non-objectivity on certain points.

THE manufacturer who undertakes such a progressive and complete program of customer orientation will find that it entails much effort and many changed attitudes, both within his company and in his dealer set-up. A longrange plan, covering every activity from the drawingboard to the customer, must be prepared and thoroughly implemented. New literature and advertising must be conceived and produced to fit various needs of the program. The distributor and dealer organization must be trained in concepts and purposes of the program; and must be provided with sample policies, procedures, rules, forms, etc.; and taught how to adapt them to particular needs of individual customers. A relatively inexpensive but continuous "intelligence gathering system", with feed-back, must be set up at an early date for keeping up with the problems and attitudes of customers and potential customers, thereby discovering new opportunities and new techniques as well as new problems which the program must solve. Meanwhile, in anticipation of success in breaching the wall around the dormant demand, he must look critically at his finances, his production facilities and his organization, and begin to plan what he will do in those areas when the results start to come in.

There is no denying that it is a big job, but it promises big results. The market is huge and barely tapped. It contains a dormant but overwhelming demand, pent-up and waiting only for the manufacturer who is willing to look at his sales potential in this new light and then equip himself to serve the need. It will be a hard, long-range job, but even the early results will be beyond his fondest hopes of the past. END

A used lightplane which has maintained its popularity over the years.

CHECK PILOT REPORT ON THE

LUSCOMBE 8-E

By DICK HUNTER

FOR A COMBINATION of an easy-to fly trainer, and an airplane which additionally offers some cross-country performance, a number of pilots have stayed with the Luscombe 8-E. Powered by a Continental 85-hp engine, the trim, all-metal, two-place Deluxe Silvaire gets off the ground in about 600 feet at lower elevations, scoots along at a solid 105 mph cruise at 2,300 rpm, and has a maximum range of 475 miles.

Typical of pilots flying Luscombe 8-Es is Jim Kardos of Cleveland, Ohio. He enjoys cruising around the lake region in the economical light ship, and it has served as a trainer for his son who soloed on his 16th birthday. Jim, Jr. reports he had no trouble in learning to handle the family's airplane. Now, Mrs. Kardos is ready to start taking flight instruction.

Jim's Luscombe is a good example of how well an all metal light plane will hold up if given normal day-to-day preventive maintenance. Built in 1946, the airplane is clean as a pin and in good repair. I visited Welcome Airport at Northfield, Ohio, where Jim bases and had the opportunity to inspect and fly his plane. This particular one was manufactured by the original Luscombe Aircraft Company which went out of business when the anticipated post-war light airplane boom did not materialize.

Sitting in the pilot's seat, the visibility is good to left, right, and over the short nose. All controls are within easy reach, and all gauges can be read without lowering or turning the head to some unusual position. In the 1946 Luscombe 8-E, fuel is carried in two wing tanks, each with a 12½-gallon capacity. Fuel gauges are on the inside panel above each door.

Starting procedure in the 8-E is as follows: set fuel selector to fullest tank; circuit breakers "On"; close throttle; set parking brakes; clear propeller, prime two or three strokes if the engine is cold; mixture "Full Rich"; master switch "On"; ignition switch to "Both"; and then pull the starter control.

The Continental usually catches quickly and settles to a smooth idle. Upon releasing the brakes, it takes just a touch of throttle to make the Luscombe roll. Its gear is equipped with a hydraulic oleo and a coil steel spring. This combination, aided by a steerable tail-wheel, adds up to easy ground handling (*Continued on page* 90)

Jim Kardos, shown at the right polishing his plane's rudder, is the satisfied owner of this 1946 all metal Luscombe 8-E (below) which cruises at 105 mph.

A lightplane is put to a new use—as a "time machine" to turn back the years in some of the old, abandoned mining or cattle towns far off the beaten path in the "wild west."

GHOSTTOWN

By TOM DENNY

IT APPEARED right over the nose of the Piper PA-11! In the early morning light I picked out the cluster of small buildings nestled at the base of one of a chain of 4,000 foothills trailing off into northern Nevada.

"There it is!" I shouted excitedly to Val Rogers in the rear seat of the Cub, "there's our ghosttown!"

Val's eyes followed my pointing and picked up the object of our search. "Yep, I see it—15 or 20 buildings still standing."

I changed the course of the Piper to parallel the hills, intending to fly the length of Main Street for a look at the site which once was thronged with miners, cowpokes, storekeepers, gamblers, drifters, gunfighters, and even a few peaceful folk.

Passing close to the hills, I found that the cool morning air was still stable, so "dragged" the street that had been asleep for 80 years, applied carburetor heat and began to let down. Maintaining a gently-banked circular path we spiralled over the town. The layout was typical. On each side of the main drag were the false front establishments which included stores, saloons, assay office, land office, Wells-Fargo Stage office, hotels, and dance halls. At the entrance to town was the livery stable, corral, and blacksmith's shop.

Extending both ways laterally from "Front" street were a number of small cabins and frontier-style houses, while on the outskirts lay jumbled remains of sheds, wagon wheels, mine openings, ore buckets and other leftovers from the gold and silver era.

I noticed as we came lower that the road leading out of town was straight and level for about half a mile. It appeared free of chuck holes and scrub brush. I indicated it as a possible landing area and Val nodded. The Cub sat down peacefully, rolled a few yards in the sandy soil and came to a stop. I taxied to the edge of town and parked in the shade of a building.

Stepping out into the old ghosttown was a thrill—it was as though my airplane was a "time machine" to turn back the years. The town was silent as a grave. In the still morning not a bush or tumbleweed, which had taken up residence in the main street, stirred a leaf. The faded buildings stared reproachfully at us through glassless windows and gaping doorways.

Val and I walked down the middle of the street, half embarrassed at our intrusion. However, as soon as we recognized the remnants of signs which at one time had proudly proclaimed "Wells-Fargo," "Hardware Store," "Saloon—Buffalo Head Lager," "Hotel," and others, the uneasiness left us and we started to browse.

In some of the cabins we found eating utensils still on the tables or shelves, remnants of a buckskin jacket and a buffalo robe, several faded photos, and other tangibles of a century past. Immediately in the rear of the town were several tunnels which we explored as far as we felt safe. Inside one of the damp mines were rusty picks and shovels, several ore buckets improvised from beer barrels and a few antique lanterns.

By the time we had explored a major part of the town, it had turned afternoon and we had not stopped for lunch, so we returned to the plane and broke out our supplies. Over a fire under a cottonwood tree, Val prepared bacon and beans, boiled water for coffee, and made pan biscuits. As we ate, I noticed that big afternoon thunderheads had formed over the mountains to the southeast, immediately on our intended route. Erupting into storm, the disturbance hung over that area moving

neither one way nor the other—a common characteristic of afternoon thunderstorms over this high country.

After several more hours of browsing in the buildings, we checked the storm and it appeared to be in the same area.

"Let's stay here for the night," I suggested, "and cross the mountains at dawn when conditions will be better for a smooth ride."

"Roger," confirmed Val, so we dug out the bed rolls and the tie-down kit. Having looked over all the possibilities we decided to bunk on the floor of the saloon. The saloon of any old western town was the center of activity. Here came the cattlemen to transact their business; miners to celebrate their strikes; gamblers to flirt with Lady Luck; thirsty cowpokes whooped through the swinging doors to wash down the dust and flirt with the dancehall girls. Here also came the paid bad man to provoke his victim into a situation where he would be compelled to draw against a fast gun.

The boardwalk in front of our saloon was broken in several places, as was the canopy over the entrance of the building. The front window was missing its panes, but the establishment still sported one-half of its pair of bat-wing doors.

Inside we found the bar room in good condition, considering the years. The floor was still solid, and the shelves intact. Several chairs and tables too remained serviceable, but the piano was a battered wreck. On the shelves behind the bar were a dozen bottles, all empty—one or two minus their necks, as if someone had demonstrated his proficiency with a six gun.

"Let's dust off a spot and park the bed rolls," I suggested.

Val found an old frock coat behind the bar and started to clean house, but stirred up so much dust that both of us were forced to leave. I grabbed a chair and went out to park under the rickety canopy until the dust settled. Such conditions were conducive to visualizing the activity of bygone times.

Probably this town did not know night as such after gold was found in the area. The flare from hastily-constructed hurdy-gurdies, honky-tonks, and gambling houses flung splashes of light on the masses of roughly-dressed men engaged in continuous revelry. Day and night the streets were crowded with an influx of good, bad and indifferent humanity which came to try its hand with fate. Freight outfits jammed the roads, trail bells tinkled as mules plodded by in unrequited patience.

Even the blasting mountain wind, violent as a tornado at times, never interrupted the thumping pianos, the squeaking fiddles, and the stamping feet on the rough floors.

Life at such a mining town usually would follow its turbulent pace for several years, or ten or 20. Then would come a day when the old town lost her bounce. Her ledges were petering out; mills were closing; more people were leaving than arriving.

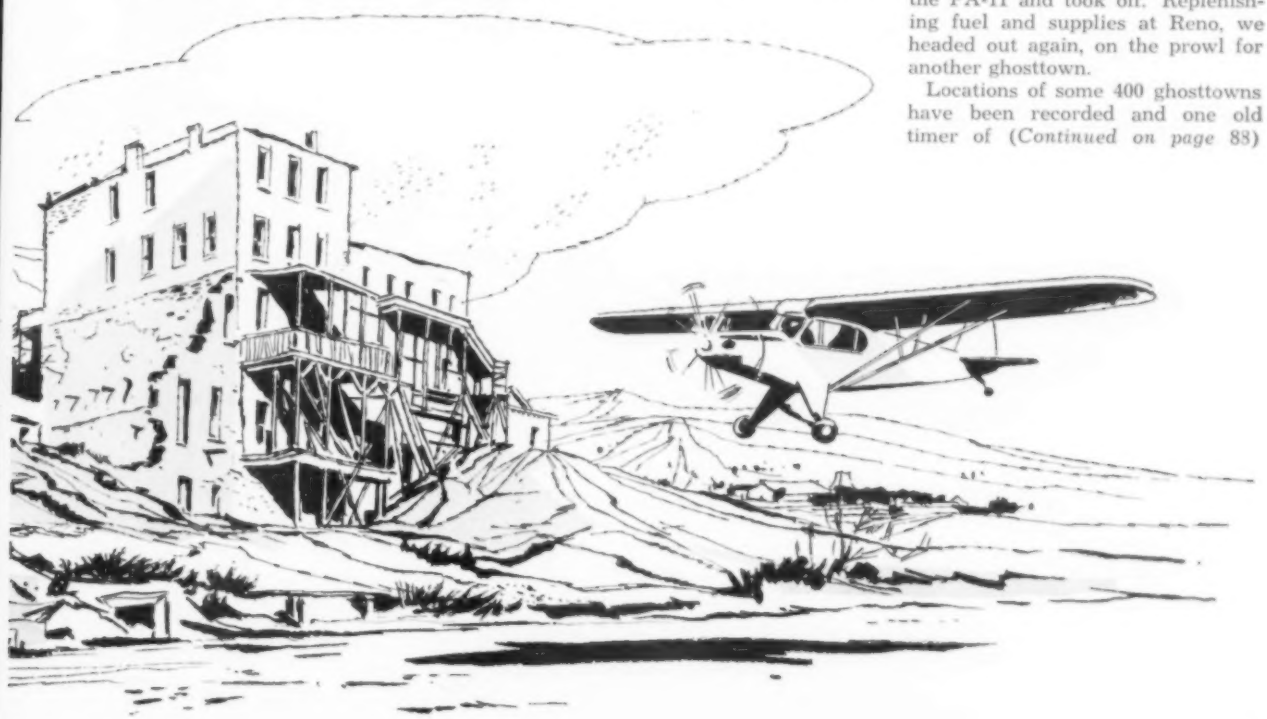
Then another gold strike at Steamboat Springs, Yellow Gap—or just over the mountain. A cowboy found some nuggets as large as pigeon eggs; a prospector found seams of native silver so pure that he could cut it with his Bowie knife. This strike is the largest yet—better get there and stake your claim!

This they did. Stores, saloons and houses were abandoned. The heavier furniture was left behind. Pack-rats moved into the grocery stores; birds began to nest in the barroom crystal chandeliers; spiders and termites took over the mahogany bars. Sage and greasewood crept back into the streets—another ghosttown was born!

And you can't imagine the quietness of night in a bed roll on the barroom floor of a ghosttown, that is until about midnight. Then a lonely wind moved into town and whistled through broken windows and down the cold chimneys, and over the nameless graves on Boot Hill. In the distance a loose shutter banged, tumbleweeds propelled by the night wind rolled down the street and came to rest a moment on the saloon steps. The bat-wing door moved gently on its rusty hinges in protest.

Next morning, after a refreshing (?) sleep, we loaded the PA-11 and took off. Replenishing fuel and supplies at Reno, we headed out again, on the prowl for another ghosttown.

Locations of some 400 ghosttowns have been recorded and one old timer of (*Continued on page* 88)



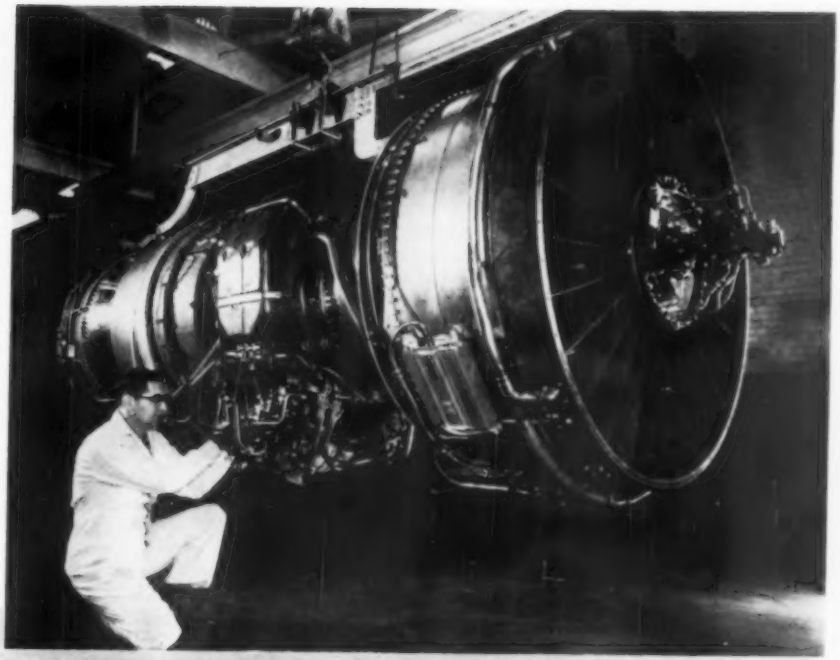
FLYING NEWSREEL

BRANTLY B-2. Right: Two-place helicopter manufactured by Brantly Helicopter Corp., Philadelphia, Pa., features an unusual double-bubble cockpit for exceptional visibility. Outboard hinged rotor blades, a Brantly design, give copter high cruising speed and ease of control. Twenty-four B-2s have been delivered in 1959.

MOONEY 20A for 1960. Above: This year's model of the popular four-place executive plane features a number of improvements both mechanical and from standpoint of passenger comfort. Available with a variety of optional equipment, including auto-pilot, it has a top speed of 190 mph. Basic price of the plane is $15,450.

WATER SKIMMER. Left: British Saunders Roe NRDC Hovercraft crossing the English channel just a few inches above water. Neither a VTOL nor a helicopter, this type vehicle operates on "ground effect" principle and, when perfected, will be useful for crossing small bodies of water, swamps and areas rendered inaccessible to conventional wheeled vehicles.

FLYING NEWSREEL

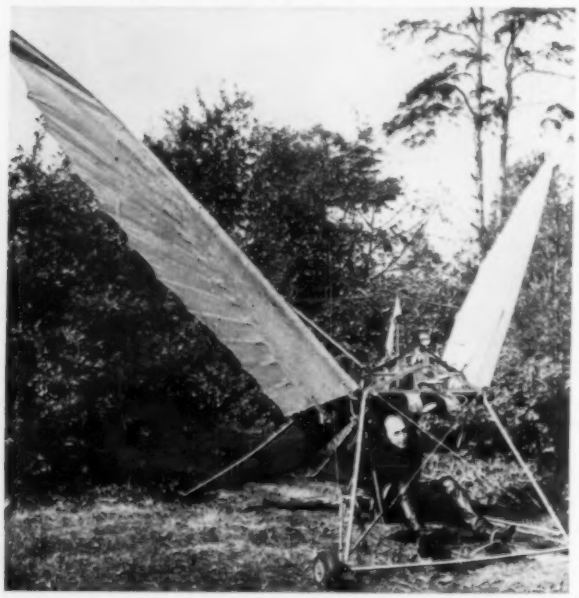


TURBOFAN. Right: Pratt & Whitney TF-33 turbofan engine, eight of which will power the missile and rocket carrying Boeing B-52H, shown below, latest version of the eight-jet bomber. Main difference between a turbofan and turbojet is the substitution of a large fan for a section of the compressor. Fan is driven by an extra turbine stage. Use of turbofan is similar to adding propellers to the turbojet. It greatly increases air mass intake, with resulting increase of power available at take-off, fuel economy is also increased. Civilian version, the JT3D, will eventually power a number of U. S. jetliners.

ANTARCTIC HERCULES. Below: With all its eight Jato bottles going an Air Force, ski-equipped, Lockheed C-130 takes off during a re-supply mission at the South Pole. In cooperation with the U. S. Navy, a number of C-130s are now operating in the Antarctic with Operation Deep Freeze 60.

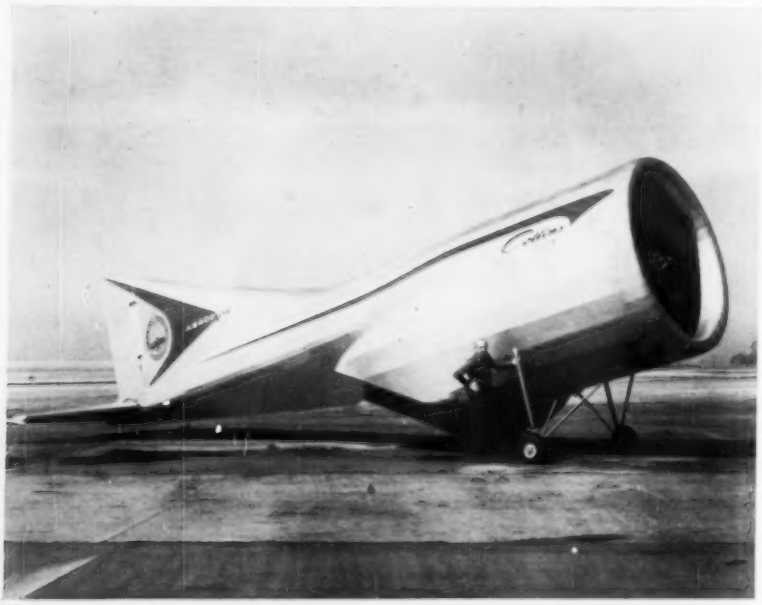
FLYING NEWSREEL

RUSSIAN FLAPPER. Below: Interest in ornithopters (flapping wing aircraft) has never relented since man first tried to emulate bird flight. Shown here is an experiment by Dmitri Ilyin of Moscow, Russia, veteran fighter pilot. Bird is powered by a 3-hp engine. Most efforts, in Russia, are sponsored by the "Flapping Wing Committee," some were successful.



SYNTHECOPTER. Above: A training device capable of simulating helicopter flight has been designed by Peter Jacobs of Edmonton, Canada. Called Jaycopter, it can rise to an altitude of 76 feet supported by boom, has operating diameter of 100 feet.

AERODYNE. Below: Wingless craft using the principle of deflected air stream by sucking air through front orifice and exhausting out of a rear vent, was designed by Dr. Alexander Lippisch, one of the world's foremost aerodynamists, now director of Aeronautical Research for Collins Radio Corp. builders of the Aerodyne. Wind tunnel model, pictured here, is powered by two 250-hp Lycomings. At right it is shown in tethered flight.



NO. 239

I learned about flying from that!

Radar, although it is one of the most important aids to flying, can be wrong!

By EDWIN G. PIPP
Aviation Writer, The Detroit News

Michigan Air National Guard's flying safety officer, Capt. Edwin G. Pipp, is a jet pilot.

IT ALL STARTED with a phone call from the operations office of the Michigan Air National Guard at Detroit.

"We have three RF-84Fs to pick up down at Mobile," the ops officer said. "Could you get a day off to fly one of them back? We've got airline reservations on a plane leaving at 1600 this afternoon."

It sounded like an easy trip, a nice airline flight from Detroit to Mobile, Ala., and a non-stop flight back in a jet the next day. The trip would have to be VFR because the planes had just been through overhaul and ferry trips were required to be flown in good weather.

Getting a day off from work was no problem, so I said I'd be out at the base in a couple of hours.

I met the other pilots, collected my flying gear and we went across the field to board the airliner. It was a nice trip down south. We were up at 6:30 the next day to check weather and to prepare our flight plan.

"Good weather all the way back with a few isolated thunderstorms that you can easily avoid," the weatherman said.

It took about 15 minutes to "buy" the airplanes, sign the half-dozen forms and collect the pile of paperwork that's involved in a transfer of aircraft from the Air Force to the Air National Guard.

The birds we were ferrying to Detroit were Republic RF84F Thunderflashes, single-seat, jet-photo reconnaissance planes which had been through the Mobile overhaul depot after returning from the Far East.

Our flight time for the 850-mile trip was to be an hour and 40 minutes over Birmingham, Nashville, Cincinnati and Dayton, with an IFR/VFR on top clearance. Our exact time of arrival over each city and fuel remaining at these check points was computed on the ground. We agreed that over Cincinnati we would double-check our fuel to be sure there was enough to reach Detroit. If there was any question, we would land at Dayton.

At a thorough briefing on our flight procedures, it was decided I would be number three man in the flight. That was fine with me because the other pilots were Korean veterans with more than 1,000 jet hours each. All I would do was fly formation with them.

We thoroughly checked our planes on the ground. Even though these planes had been flight-tested, there was still the chance that a mechanic had forgotten to tighten some bolt properly or used the wrong equipment or tolerances to check an installation. But they checked out okay on the ground, except that all had less fuel than we had estimated. However, it was not a shortage that would prevent us from reaching Detroit, if weather conditions were as predicted.

After getting the ATC clearance, our leader signaled to start engines and we checked in with him over the radio. Number two man reported he would not be able to leave with us because of generator troubles. We had decided beforehand that, if any two planes were able to take off, they would make the trip. So I followed the leader to the runway.

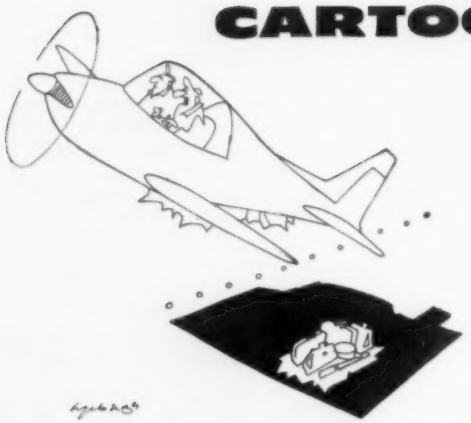
I watched the instruments closer than usual on take-off, but everything was in the green.

We climbed around beautiful cumulus clouds to 32,000 feet. There was a slight amount of radio trouble at first as I checked with the leader, but it straightened itself out.

Our flight passed over Birmingham right on time. But we were both a few hundred pounds below our estimated fuel load because of the fuel shortage at take-off.

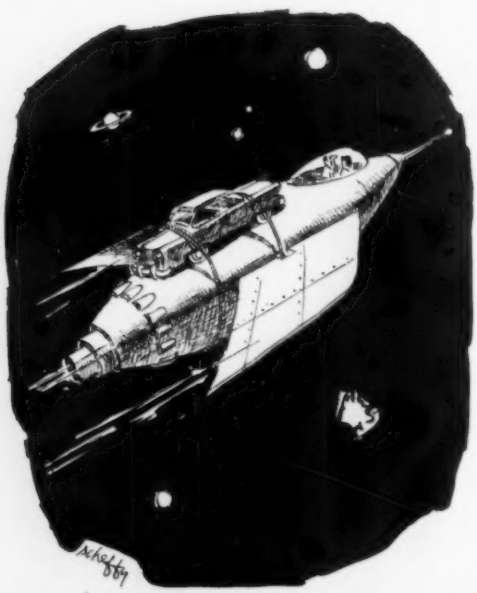
Nashville was the next check-point. We both had trouble picking up the station with our low frequency ADF receivers, the only radio navigational aid in the planes. However, as we got closer, it came in clear. We arrived over Nashville a minute early, (*Continued on page* 108)

CARTOON REVIEW



"I didn't think we'd make it with all that luggage aboard . . ."

"According to the airline schedule, you'll be back yesterday morning."



"Well, you certainly don't expect to *walk* when we get there, do you?"

"It's heck these days when you can't get a seat on the bus!"

"No one will give up a seat by a window!"

FLY SMOOTHER, EASIER, FASTER WITH TACTAIR AUTOMATIC FLIGHT!

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Jato

(Continued from page 60)

from minus 60 degrees F. to plus 165 degrees F. and carry FAA type certificate No. 250.

Ignition of the rocket engine's high-energy, plastic-base solid fuel is by the normal electrical system of the aircraft. The burning rate is controlled automatically for constant thrust, and the units can be used at altitudes up to 35,000 feet. Nomenclature for the "Junior Jato" aircraft rocket engine is 15NS-250.

Wild also mentioned that the installed weight of the two bottles is 104 pounds and that there is no weight penalty. Aerojet-General, manufacturers of the rocket engines, report that gross weight increases equivalent to the installed rocket engines are permitted in non-transport category aircraft within their structural limits.

Harp Wild then invited me to ride with him when the installation was completed. I gladly accepted and, when Aircraft Service, Inc. phoned me several days later, I was on their apron at the appointed time.

Prior to the flight, Wild and I talked over several possible ways in which the check could be conducted. As the cost of replacement is about $375 per bottle, and in the Super 18 installation both bottles are fired together, Harp wanted to make sure that he got the best return on the $750 expenditure for training.

As one of the major problems which can face a light-twin pilot is the failure of one engine during take-off and climb—especially when the airplane is loaded to gross—Wild decided that he would simulate this situation to check out the maximum effort of the jato bottles. The initial rate of climb on the two P&Ws operating normally would be compared against the initial rate of climb with one P&W only plus the aid of the two Aerojet-General rocket engines. We were both interested in seeing how soon we could gain 500 feet of altitude above the ground which, if an engine was actually out, would put us in a fairly good position to fly safely a single-engine pattern and land the Beech.

Harp and I climbed into the office of the Super 18 to go over the preflight check procedure on the jato control system. The 12 by 3 inches control panel is mounted overhead and within reach of either pilot. Wild mentioned that the check takes just a few seconds and follows this procedure:

- The aircraft master switch is checked to make certain to be in the "off" position.
- Jato circuit breakers on instrument panel are pulled to the "open" position. (Power to check out the continuity of the jato firing circuit is supplied by a miniature dry cell battery inserted into the panel. Power to fire the rocket engines comes from the aircraft's primary source of electrical power.)
- Check of the firing circuit is made by turning a knob to set an ohmmeter to read eight ohms. Then the meter selector switch is set to read either left or right position first and each jato circuit is checked separately to see if the meter reads within the white section marked on the face.
- Once this is completed, the knob is turned to the "Off" position.

Prior to take-off, the jato bottles are armed by:

- Closing the jato circuit breakers on the instrument panel.
- Turning the key switch on the overhead panel to "arm" position and noting whether two red warning lights come on.

If the standby power is required, the rocket engines are fired by a flick of a spring-loaded toggle switch located on the overhead control panel. When the take-off is normal and the aircraft is at a safe altitude, the key switch is turned from "arm" to "off" and the jato circuit breakers are opened.

For the flight check, Wild loaded the Super 18 to a gross of 9,800 pounds.

NEXT MONTH IN FLYING

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Aboard we had five volunteer passengers in the cabin and two pilots in the office; in the fuel cells were 270 gallons of gasoline. The 450 P&Ws were fired up and we taxied out to the runway after receiving clearance from the tower.

Conditions for the comparison check, flown off runway 9 at Cleveland-Hopkins, were: runway elevation, 789 feet; wind east northeast at six knots; outside air temperature 81 degrees F.; and barometric pressure 29.81.

On the first take-off, which was made normally, it took the Beech 38 seconds to reach the 1,300-foot level (MSL). After breaking ground, this was actually 511 feet above terrain. Rate-of-climb showed some 800 fpm.

The next take-off was started as a normal one, and then as the Beech lifted, the right engine was throttled back all the way. As the airplane yawed to the right, Wild flicked the toggle switch which fired the bottles. There was a "whooshing" noise heard above the reciprocating engine and the slipstream, as the rocket engines developed their thrust instantly and smoothly. With approximately 450 hp from the P&W plus the 100 hp from the rocket engine (or a total of 550 hp on the left side), there was only the equivalent of 100 hp on the right and this, of course, resulted in an unbalanced power distribution. Harp found he needed about three-quarters of the left rudder travel to hold the Beech on its climb-out heading.

As soon as the rocket engines were fired, Harp took full advantage of the thrust, pulling up the nose of the Beech. This is a point that some pilots fail to remember when they first use jato and consequently do not get full benefit of climb available at that time. To check maximum performance, Harp climbed the Beech at a steeper angle than normal; we both checked closely to see if the rocket thrust was constant at this steep angle of attack. It was, and the P&W plus the rocket engines took the Beech up steadily at about 1,200 fpm. It took 28 seconds from the time that the Beech lifted off the runway, "lost an engine," developed rocket thrust, and climbed to the 1,300-foot (MSL) mark or 511 feet above the ground.

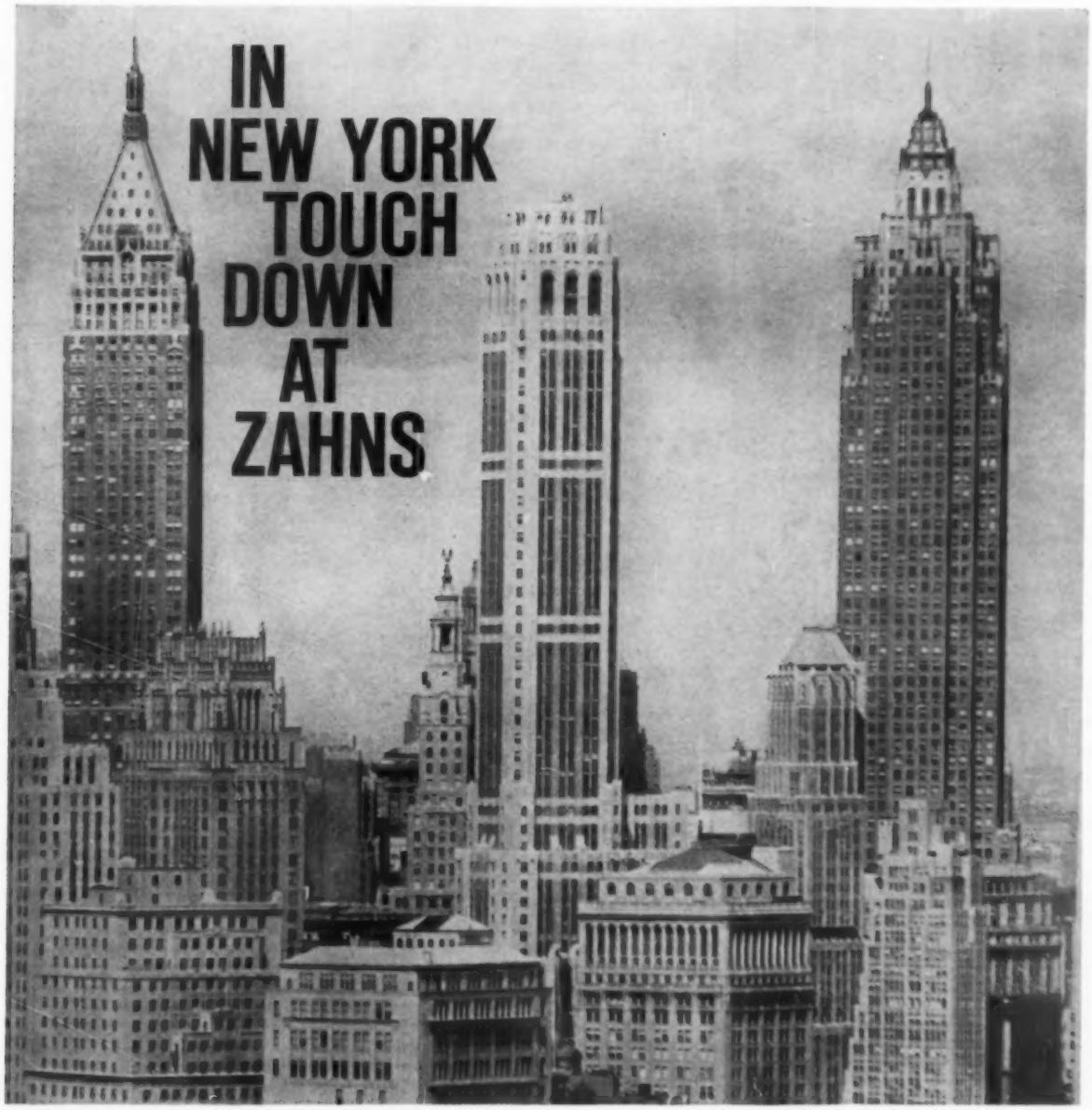
Such dependable performance from the jato bottles is not unusual as jato, as such, has been under development for nearly 20 years. The first unit which was used in actual military work was developed in 1942, and was put into extensive use as a means for assisting in the take-off of heavily-loaded flying boats. It became known affectionately as "old smoky" because of the smoke it produced, and later found wide use in military aviation. It was not designed, however, for standby use, and had limitations as to life, operating temperatures and altitudes.

About seven years ago the Aerojet-General 15KS-1,000 was developed for standby use, and in it the objectionable limitations of previous rockets, including the smoke, have been eliminated. In describing the rocket engines as smokeless though, it must be pointed out that this means relatively smokeless. Actually in low humidity they are almost completely so except for the smoke that is emitted at the end of the burning period.

However, this dissipates itself immediately. In case of high humidity, as on the day of the flight check in the Twin Beech, they will emit about as much smoke as a rich burning, reciprocating engine.

Upon its release for civilian use, the 15KS-1,000 which generates thrust equivalent to 450 hp for 15 seconds, was soon installed by a number of airlines. The advantages of standby power also became apparent to pilots of light twins and Aerojet-General then brought out the smaller version or "Junior Jato." Like its bigger brother, the junior-size bottle is also certified for life of one year or 500 hours, whichever occurs first.

Price of a kit for the Super 18 is around $2,960 and Aircraft Service, Inc., which made the installation for the Ohio industrial company, estimated a typical job to take some 150 manhours. END



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New Pilot Requirements

(Continued from page 37)

of the new regulation. I quote from the preamble to the amendment:

"The number of fatal accidents clearly indicates the need for higher Private Pilot qualifications. During 1958 Private Pilots were involved in a total of 272 major accidents in which 345 pilots and passengers were killed and 155 seriously injured. Of these accidents, 120 or 44 per cent resulted from inability to cope with emergencies which developed primarily enroute, such as becoming lost, loss of control in instrument conditions, and collisions with objects in reduced visibility. A total of 125 or 45 per cent resulted from fundamental weaknesses in pilot judgment or technique such as stall/spin (author's note: Spiral??). Due to inadequate speed, control, attempting operations beyond the pilot's or aircraft's capability, inadequate or no flight planning or preparation, and exhausting or mismanaging fuel."

This rather dismal statistical record, when the individual cases are analyzed, shows a repetitive and significant pattern. The Private Pilot, perhaps carrying family or friends as passengers, loses all visual contact with the ground by inadvertently encountering instrument weather. Untrained in positive control of his aircraft by instrument reference, it is physiologically impossible for him to control the aircraft at all. The usual result is the familiar pattern of a "graveyard spiral," and almost certain death for not only the pilot, but his perhaps unsuspecting passengers.

No one accuses the Private Pilot of deliberate instrument flight. Intentional instrument flight is specifically forbidden by the Civil Air Regulations unless the pilot possesses a valid instrument rating. The sad fact is, of course, that the Private Pilot cannot avoid unintentionally finding himself "on instruments," if he flies far enough or long enough.

It is the clear and inescapable responsibility of the Federal Aviation Agency, therefore, to assure a minimum safe capability on the part of the applicant for a Private Pilot certificate, i.e. that he can demonstrate in an actual flight test the ability to safely, positively and manually control his aircraft by sole reference to flight instruments.

This is exactly what the new regulation provides, and quite properly so. Can you imagine a state licensing an automobile driver who could not control his vehicle? Far worse, perhaps, is the picture of the Federal Government issuing a "certificate of competency" to a pilot who cannot control his aircraft except in good visibility.

Specifically, the new regulation provides that, after March 16, 1960, an applicant for a Private Pilot certificate must: "Demonstrate in simulated instrument flight to an FAA inspector, or to a designated flight examiner with an instrument rating, ability to safely control an aircraft by sole reference to the aircraft flight instruments. This demonstration shall include manual control in the following:

(1) Recovery from the start of a power-on spiral.
(2) Recovery from the approach to a climbing stall.
(3) Normal turns of 180 degrees left and right to within plus or minus 20 degrees of proper 180-degree heading.
(4) Shallow climbing turns to a predetermined altitude.
(5) Shallow descending turns at reduced power to a predetermined altitude and
(6) Straight and level flight."

In order to make crystal clear the requirements of this flight demonstration, this section of the regulation contains a "Note," as follows:

"The basic criteria for a satisfactory demonstration shall be safe and positive manual control, not precision in speed, altitude and direction control. Nevertheless, unsafe or unsure control of airspeed, erratic loss or gain of altitude or consistent failure to maintain the direction of flight shall be disqualifying. . . ."

The key words, clear and unequivocal, are "safe," "positive" and "manual." In performing the required demonstration, "systems" which rely on aircraft stability instead of manual control ("hands off" systems) cannot by any "interpretation," in the writer's view, fulfill any part of the demonstration requirements. The applicant would be wise not to attempt the flight test until he has learned to safely control the attitude of his aircraft by positive manual control of pitch, bank and power.

As to instrument flight instruction for the Student Pilot, the new regulation states:

"Dual instruction in the control of an airplane solely by reference to instruments, given by the holder of a Flight Instructor certificate with an Airplane Rating. The airplane shall be equipped with at least a sensitive altimeter, turn and bank indicator, and a means of simulating instrument flight conditions. This instruction by reference to instruments shall be integrated with the dual flight instruction in the primary flight maneuvers given before and after solo . . ."

In providing only this very general training requirement, the FAA acted wisely. As one high FAA official stated to the writer in substance: "This is a safety regulation, not a training specification. Safety begins with competency, and competency begins with having the basic skill of controlling the aircraft positively, safely and manually under all visibility conditions. The only way we can be sure that the applicant for a pilot's certificate possesses this skill is to have him demonstrate it in actual flight.

"We do not presume to prescribe in detail how the applicant is to acquire that skill. If, after a minimum of air instruction, he can learn the rest by riding a hobby-horse, more power to him."

(Continued on page 78)

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(Continued from page 76)

This is a good regulatory philosophy. Note that no increase in the minimum number of dual or solo hours is required before the student may take his tests for the Private Certificate. No minimum number of hours of instrument flight instruction is prescribed. The applicant during his training may, in addition to flight instruction, utilize self-instruction through books, or get practically all of his skill through instruction or practice in a synthetic trainer. Furthermore, he can utilize an aircraft with only a "partial panel" of flight instruments. The minimum "partial panel" is an airspeed, turn-and-bank, and sensitive altimeter. Under the regulation, the turn indicator may be operated electrically, or by vacuum derived from a motor-driven or a venturi installation.

Thus a minimum of equipment and expense will satisfy the regulation. Though not satisfactory for precision instrument flying, control by partial panel reference is quite safe and positive in light aircraft. Mastery of the simple "1-2-3" or "needle, ball and airspeed" system, as it was known in the military, will be quite adequate as preparation for the demonstration required of the Private Pilot. Precision is not required, only "safe," "positive" and "manual" control.

In addition to the foregoing skill requirements, the applicant for the Private Pilot Certificate must have received dual instruction in the following:

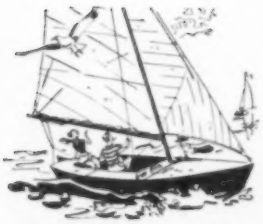
"(1) Crosswind and simulated soft-field take-offs and landings;
(2) Climbing and Gliding turns at minimum safe speeds;
(3) Cross-country navigation by reference to aeronautical charts;
(4) Safe operating procedures in simulated emergencies such as engine failure, loss of flying speed, marginal visibility, deteriorating weather, getting lost, and similar critical situations;
(5) Conforming with air traffic control instructions by radio and lights; and
(6) The proper use of two-way radio communications, VFR navigation procedures and techniques: *provided*, that, in areas where ground electronic communication equipment and navigational aids are not available within 100 miles of the base of operation, a synthetic trainer may be used for training in air traffic procedures, phraseology, and radio navigation."

(Author's Note: This is the one provision of the regulation with which I disagree. A synthetic trainer is a practical and time-saving device for training the student in all phases of air traffic control and communications procedures, as well as radio navigation.)

Finally, the regulations provide that the applicant for a Private Certificate shall have knowledge of:

"(b) The practical aspects of cross-country flying, including flight planning, map reading, pilotage,

(Continued on page 80)



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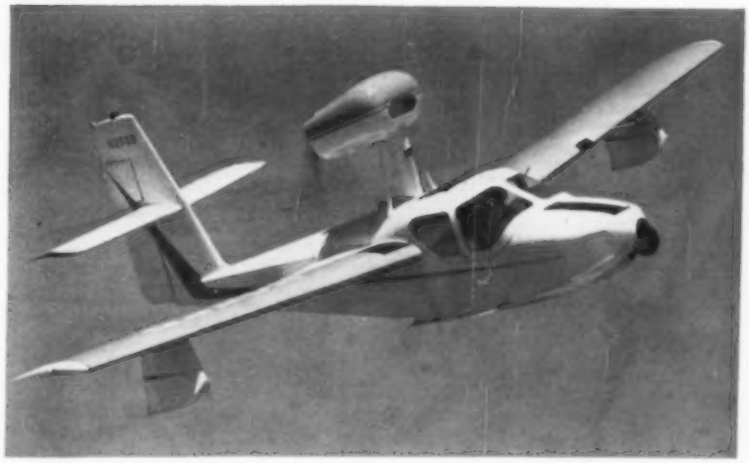

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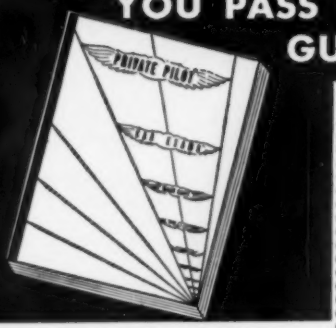

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(Continued from page 78)

radio communication procedures, radio navigation, and emergency procedures."

This provision requires knowledge that may be vital to the Private Pilot in emergencies, and is reasonably required in the new regulation.

Present holders of the Private Pilot Certificate are *not* affected by the new regulation. Nevertheless, they should note the "warning" contained in the preamble as follows:

"Additional revisions of the Civil Air Regulations to further implement this safety program are under consideration and, if adoption is found desirable, will be circulated for industry comment."

Considering the fact that there are nearly a half million Private Pilot Certificates now outstanding, approximately 140,000 of which are "active," it would indeed be surprising if the Federal Aviation Agency, in the proper and reasonable exercise of its safety responsibilities, did not either provide by regulation for their "upgrading," or else curtail their flying activities so as to be in line with their competency and capabilities.

Of course, the present Private Pilots who are smart will upgrade themselves voluntarily—and now. After all, no regulation will save their necks, but knowing how to control their aircraft "safely, positively and manually" by sole reference to instruments just might. END

Sport Planes

(Continued from page 49)

rough fields where planes with higher wing loadings would be in difficulty. But most of all it would be a type of flying with few inhibitions. It would be a type of flying that improves and tests the pilot's skill. The ability to follow instructions from the ground and analyze instrument readings would be secondary. The feel for the craft would be primary. A sense of the emotion of flight would be a sure result of a true sport plane. I am talking about esthetics now, and perhaps there is little place for esthetics in today's interpretation of flight, but I feel differently. Come with me.

It has been a long time since I took a good look at the strip at Shavers Summit. This spot is an isolated airfield in the pass between the Coachella Valley, Calif., and the desert wastes west of Blythe. A transcontinental highway passes the field and there is a filling station and roadhouse.

When I took off from Palm Springs, the beacon east of Thermal at the foot of the pass was still flashing as I climbed into the hot dawn air. Pink light tinged the grey clouds piled along the distant Colorado River. Behind me, the towering mass of San Jacinto Peak brooded over the quiet streets of Palm Springs. I had hand-propped my Waco and was climbing away toward Indio long before anyone had awakened at the airport. Twenty-four hours before, I had purchased the ship at Santa Ana and had flown it away from the shore to avoid being trapped by

(Continued on page 82)

For a 14" x 10" lithographic print, suitable for framing, write Aviation Division . . . request Historical Series #3.

February, 1916 . . . Guynemer in a Nieuport XI attacks an L.V.G. two-seater.

Early War Birds—THE NIEUPORT XI

This biplane was introduced in the fall of 1915 as France's answer to the Fokker E-1 and its forward-firing synchronized machine gun. Developed as a smaller version of an existing two-seater, the Nieuport XI was the first model in a series of "V-strutter" scouts used up until 1918. The XI was powered with an 80-horsepower rotary engine that gave it a top speed of 97 m.p.h. with an initial rate of climb of 750 feet per minute. Since the Allies had yet to come up with a synchronizing device, a single Lewis machine gun was mounted on the top wing to fire over the propeller.

With the appearance of the Nieuport XI, France had its first real "fighter plane" . . . and a new breed of heroes like Georges Guynemer to fly them. Frail, sickly, yet filled with an intense desire to fly, this youth argued his way into pilot training after serving as a mechanic. Upon becoming a pilot, he was assigned to Escadrille Morane Saulnier 3 (later the famous "Les Cigones" or "Storks"). Early in February, 1916, a few months after he had been assigned a Nieuport XI, Guynemer brought down three L.V.G. two-seaters in the space of forty minutes. The first of these was not accredited since it was not observed. However, the other two fell in sight of the Allied lines less than 10 minutes apart. This notable feat, which brought his total to 6 victories, was the first in a series of skillful and daring exploits.

By September 11, 1917, Captain Guynemer, at 22 years of age, had 53 accredited victories and was the French Ace of Aces. On that day, he flew his last patrol . . . vanishing mysteriously without a trace. To the end, the legendary "Winged Sword of France" remained seemingly invincible, accepting nothing from his enemies...not even a wooden cross.

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(Continued from page 80)

early morning coastal fog; a trick I had used during the war as a ferry pilot with the Sixth Ferrying Group at Long Beach. I was headed for Phoenix and wanted an early start to avoid the heat of the desert. My flight plan called for a refueling stop at Blythe in about 50 minutes, and then an hour and 25 minutes to Phoenix, Ariz.

This was the end of a search of several years for a suitable plane with the ability to do aerobatics and tow gliders. The crop dusting profession had pretty well cleaned out the Stearmans and the N3Ns. Before the war, I had flown the Waco UPF-7 a couple of hundred hours as a student at the Boeing School of Aeronautics, but I needed a little something extra for this job. I found it. The Waco I was flying was a Stolp-Adams conversion. The engine, propeller and cowling came from a twin-engine Cessna T-50 and were mounted on a modified engine mount. The front cockpit had been covered with a removable metal cover. The rear cockpit had been enclosed by installing a BT-13 windshield and fairing in a built-up turtle-deck back to the vertical fin.

With the 300-hp Lycoming engine swinging a Hamilton Standard constant-speed propeller, this little ship climbs a thousand feet a minute! Because of a lack of space elsewhere, the original center section tanks are the only source of fuel. At 130 mph there is about two and one quarter hours' range available. This is not primarily a cross-country ship. It's for sport.

As I flew through the pass at Shavers Summit, I was about 1,000 feet above the ground heading into the early morning sun with the mountains on either side of me. No radio. The slapping of the wind near my ear. The rattle of the exhaust. The flatting of the propeller. These were the noises of an airplane. The smell of hot oil brought back the days when it was an adventure to fly. I had turned back the clock. I was enjoying a flight as a flying experience for the first time in many years. These were things I had longed for as a boy yearning to fly. These were moments which stirred me later when I did learn. The feeling of being a part of the sky was something that had been lost as the years passed and the equipment grew more and more complex. Cross-country flying had become a series of procedures. Each stage of the flight had to be controlled for the safety of everyone using the airways. So be it! But, for now, I was flying again.

The desert in the early morning is a stark thing when seen from a low altitude. The dryness of it seems dryer, the distance seems greater. I have been flying this route along Green Five for the past 15 years, always above 10,000 feet, and the mountains had lost their formidable qualities. They didn't seem like much of a barrier. On this morning, however, at this altitude, scale was restored. I even caught myself talking out loud about check points, observing the countryside below and items concerning the function of the plane. It has been many years since I have had so much fun in an airplane.

While gassing up at Blythe, I met a man from the San Francisco area heading west. He was put-putting along in a Ryan PT-22, helmet, goggles, and all. Why? Because he wanted to feel again the sensations of flying. The average plane today is only a means of transportation. A very good one, to be sure, but not much fun to fly after the first hours of newness are past. This stranger and I were kindred spirits. He was relaxed and enjoying his flight. I'm sure that there must be many more like him.

This is not a plea to turn back the clock in the design of aircraft. It is a call to the designers to put something into the air incorporating all the technical advances of the past 20 years. An airplane whose integrity is such that the average man can develop his skill at flying through aerobatics. It may be quite possible that the reason the youth of today are not to be found around the airports of the nation is that they cannot see any fun in flying craft that are so restricted in their performance. If a training course held the promise of aerobatics and the student knew he would have the opportunity to learn to fly the plane through a series of acrobatics, possibly more of them would rise to the very real challenge. Certainly those who did would be more skillful pilots.

If aircraft designers and manufacturers would apply the latest materials and construction methods in the building of a sports plane, I'm sure that there would be a market. My Waco is heavy and it burns a lot of gas each hour. But it is strong and it was designed to get around the sky. It will go over on its back and roll right side up without coming apart. It will spin, and it will do many things which will teach its pilot confidence in his craft and himself. It will demand that the pilot be in charge. And in return, it will give him a grand ride, but my Waco is an antique. It has sentimental value as well as a practical purpose for me, but when the day comes that it can no longer pass a periodic inspection without a large expenditure of money, I will ground it. I hope that by then there will be a modern airplane to fulfill the need for a true sport airplane at a reasonable price. END

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Rate of Climb	1150 fpm	1010 fpm	1300 fpm	1400 fpm
Service Ceiling	20,000 ft.	19,800 ft.	20,700 ft.	20,000 ft.
Range (Max. @ 10,000 Ft. No Reserve)	1110 mi.	1170 mi.	1100 mi.	1100 mi.
Take Off Distance	600 ft.	900 ft.	740 ft.	750 ft.
Landing Distance	550 ft.	570 ft.	520 ft.	650 ft.
ECONOMY				
Initial Cost (Standard Equipment)	$15,450	$19,995	$22,450	$18,995
Factory Eng. Exchange Price	$ 1,532	$ 2,414.84	$ 3,056	$ 2,962
Hourly Gas Consumption (75% Power)	10.8 gph	13.4 gph	15.8 gph	15.6 gph
Total Hourly Operating Cost (300 hrs./yr.)	$17.71	$22.42	$22.31	$25.90
First Year's Operation (300 Hours) a Mooney Saves You	→	$1,413.00	$1,380.00	$2,457.00
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Control Systems	Steel Push-Pull	Cables—Pulleys	Cables—Pulleys	Cables—Pulleys
Airline-type Ventilation	Yes	No	Yes	Yes
Low-wing Visibility	Yes	Yes	No	Yes
Stalling Speed	57	57	59	64
Tubular Steel Cabin Frame	Yes	No	No	No
Retractable Entrance Step	Yes	No	No	No
Tinted Glass Windows and Windshield	Yes	No	Yes	No
Laminar Flow Wing	Yes	No	No	Yes

*Above figures are taken from manufacturer's advertised specifications.

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Cessna 407

(Continued from page 55)

surprise, I tried to turn the nose with the rudders but all I could feel was the free swinging of the fin and no response from the nosewheel. Hagan then explained that nosewheel steering is by a hydraulic system which does not engage until a button on the stick is held down. This gives a pilot two methods of control—with brakes or with the steerable nosewheel. The first is normal in every respect. The latter is a bit tricky the first few times one uses it. There's a slight delay between pressure on the rudder and the steering reaction. It's not much, but sufficient to make a novice think he hasn't pushed hard enough. He pushes harder—and about that time the action takes place and he finds he has overcontrolled. After a few tries he learns to anticipate and thereafter can steer a straight line.

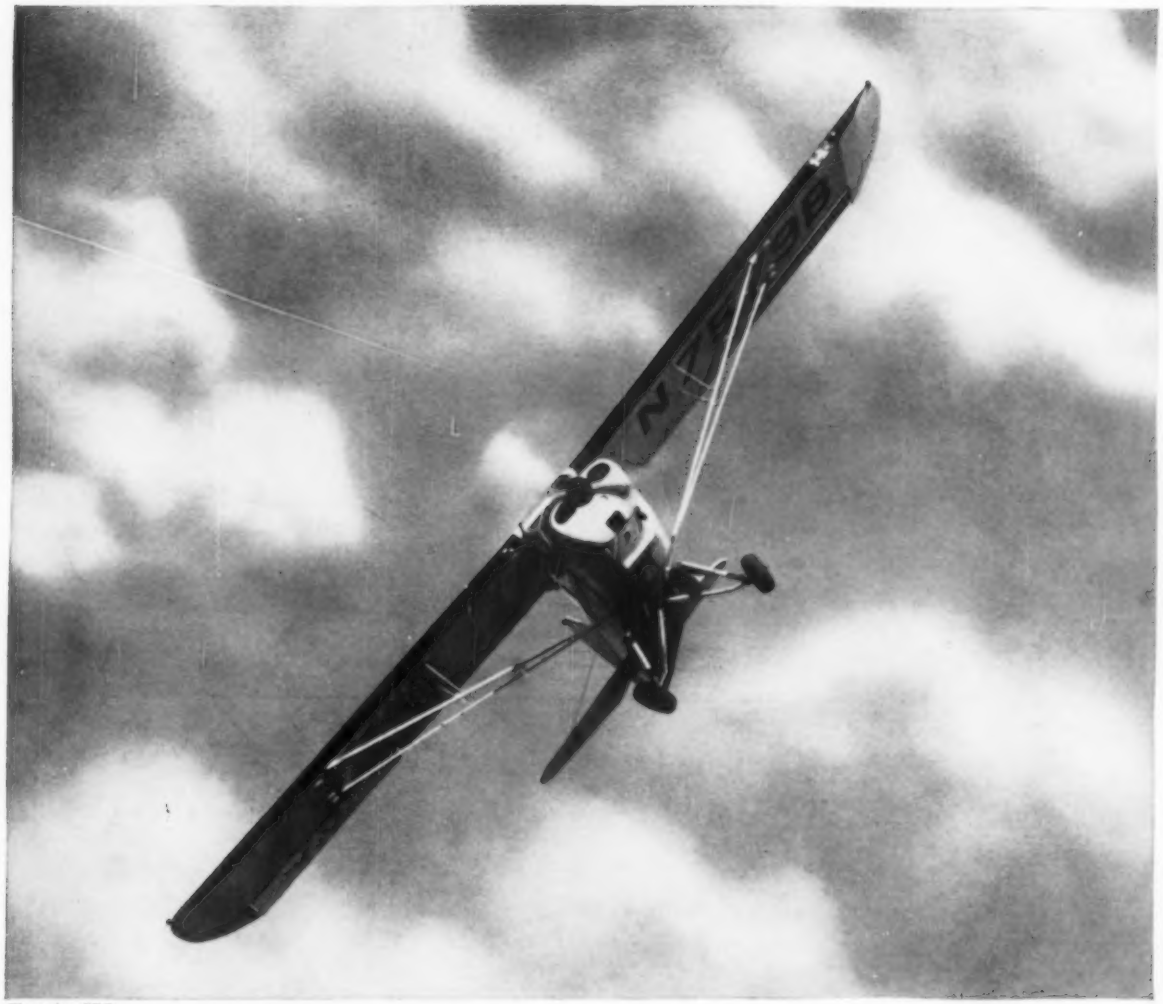
With clearance for take-off, Hagan made the first one so I could get acclimated. Lined up with the runway, he held the brakes and applied full throttle. As 100 per cent rpm was indicated, he released the brakes and we started moving without hesitation. The acceleration was a definite force in the small of the back. At 60 knots, the pilot lifted the nosewheel and, at 80, we were off the ground. In no time the airspeed needle was pointing at 200 knots and the rate of climb hovered at 3,000 fpm. Slightly more than four minutes from the time we started rolling, we were passing through 12,000 feet and beginning to level off. Throttled back to 95 per cent of rpm, our airspeed read 270 knots. Unfortunately, we had no outside temperature gauge. We called two other T-37s flying in the vicinity, but they also were sans thermometers. Making a guess, I worked on the basis of 0 degrees Centigrade. This gave us a TAS of 335 knots or 386 mph.

While Bob ran some fuel flow checks, I stooged around. In comparison to the Cessna 182 or 210, the controls felt stiff. But, as one begins to maneuver the airplane from turn to turn, the rapid rate of roll makes one glad the controls are not too soft. If they were, a new pilot might overcontrol and get into trouble. In terms of a cross-country airplane, which the 407 is, the control pressures are just right.

The airplane flies beautifully with aileron only. Once off the ground, most pilots will fall into the habit of using the rudder pedals as a foot rest. (Student pilots should not do this lest they get into trouble with their instructors.) The T-37B appeared to be extremely stable directionally. At one time I was off the controls for five or six miles. It flew as straight as if I'd been holding a heading.

Once or twice we ran through patches of turbulence. The feeling was that of riding in a heavy airplane. In the short stubby wings there seemed no discernible flexing. In very turbulent air this could lead to a pretty jolting ride. Perhaps this is seldom a problem at the higher altitudes where the 407 would normally cruise. On the other hand I've been told that the wing flexibility of the larger jets

(Continued on page 86)



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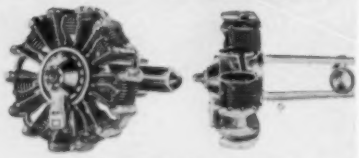

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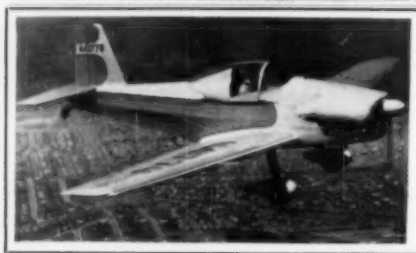

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(Continued from page 84)

has a great deal to do with a "softer" ride. Consideration of this might be a good point in the development of the 407.

Stall characteristics with gear and flaps up were excellent. A good buffet occurred at 90 knots and the stall at just under 80 knots indicated. Actually it was not real full blown stall. It was more like a 172—the plane just hung-there buffeting. If you held it long enough, the nose would bob a bit and finally begin to fall off. Relaxing of back pressure only was needed to start flying again.

Power-off stalls with gear and flaps down were different. In prototype development stages it was found that, due to the high placement of the horizontal stabilizer and because the nose didn't get high enough, there was no downwash on the elevators and thus no warning buffet. The stall could occur with startling suddenness. To overcome this, the engineers designed a little gate which normally lies flush about 18 inches back of the air intake. When flaps are down 20 per cent or more and speed is reduced to approximately 20 mph above stall point, these gates come up. Their function is to induce turbulence in the airflow and set up buffeting to warn of the impending stall. This arrangement works very much like the ordinary stall warning device.

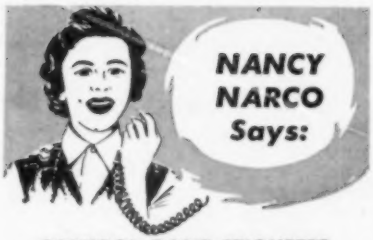
The "gear and flaps down" stall surprised me in that it wasn't as easy and pleasant as the "gear and flaps up" stall. Not that the stall was bad in any respect. It just seemed to let go faster and more completely with some tendency to roll. But, as Bob pointed out, "The buffeting is so pronounced at a speed so much higher than the stall that I don't see how anyone could get in trouble."

Throttling to 84 per cent, we let the nose drop and came whistling down at 3,000 fpm. Leveling off at 2,500 and boosting power back up to 95 per cent of rpm, the airspeed stabilized at 310 knots or 357 mph. I put the stop watch on the section lines. They flashed by every ten seconds just as regularly as the watch was ticking—360 mph.

Back in the traffic pattern, Bob shot the first landing to show me how. He pitched out in the military manner, threw out the speed brakes and, at 120 mph, lowered the gear. He used the flaps as needed or desired and held 100 knots on the final approach. As we approached the end of the runway, he said, "Watch this." Touching down considerably beyond the end of the cement, he applied the brakes. There was absolutely no tire squeal nor did the brakes sound off, yet we were practically at a full stop by the first intersection which turns off to the Cessna plant—some 1,500 feet! That is short landing in a fast, clean airplane. Those brakes are the best anchors I've ever felt outside a full fledged racing sportscar. They're smooth and without grab. This little demonstration certainly lends weight to Cessna's claim that the 407 can operate off a 4,000-foot strip, gross weight, at almost any reasonable altitude.

It was now my turn to make take-offs and landings. After doing so, I'm sure anybody who can handle a 182 can han-

(Continued on page 88)



CONTROL ZONE ETIQUETTE

If you're on a cross-country trip VFR and your course takes you through a Control Zone, what are you supposed to do? You look up the rules and regulations and you'll find it's not too specific.

But first, let's review what a Control Zone is. Normally, it's an area five miles in radius around any tower-equipped airport with, in some cases, a control zone extension covering the air space used for instrument let-downs. These areas are clearly indicated on charts by broken dash lines. These Control Zones take on significance *only* when conditions get below VFR—less than 1000 foot ceiling and less than 3 miles visibility. Under these conditions you cannot enter the area without clearance from the Tower.

If conditions are VFR, then your procedure in passing through a Control Zone depends more on good operating practice than any specific regulations. There is no need or requirement to contact the Tower while passing through the Control Zone as long as you do not interfere with the normal traffic pattern. Good practice for the safety of yourself and others suggests the following, however:

1. When you're 10 minutes out, tune in to the Tower and listen. You'll get a good picture of what traffic there is, where it's coming from and where it's going.

2. If you're below 2000′ and will pass within a mile or two of the airport (close enough to worry the Tower), then you should make your identity and intentions known by calling the Tower.

3. At lower altitudes you should plan your flight by the airport so that you're not going against traffic. Generally if you fly by to the right of the airport (keeping it to the left of you) this will automatically keep you in step with the traffic, especially with larger aircraft making a circular left-hand let-down into the pattern.

There are an increasing number of High Density Zones and the regulations are more specific. The Zone specifically covers an area from the surface to 3000′ and usually covers more territory. These areas are shown by a double criss-cross line and are listed on the bottom margin of the chart.

A 180 mph speed limit is mandatory within the Zone (unless your jet would stall out) and you cannot enter the pattern without two-way radio contact or prior permission. If you are passing through an HDZ at 3000 feet or below, contact with Approach Control is recommended. Indicate to them your intentions—course, altitude—and monitor their frequency. Since HDZ Approach Controllers use radar, they will then be better able to give you and others proper separation.

Regards,

Nancy

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(Continued from page 86)

dle this airplane. A little practice helps to become accustomed to the additional weight and speed. On my first take-off, I followed Bob's example, held the brakes until power was at 100 per cent of rpm and let 'er roll. Acceleration is good. Even after breaking ground there's no feeling of "hanging on a thread."

On the second take-off, I didn't hold the brakes. This time the beginning roll felt a little mushy but as power got up to 80 per cent acceleration built up and once again everything felt normal.

Landings are equally normal in every respect with one exception. On the entire approach, power is held at no less than 65 per cent until the landing is assured. This is to guard against the jet's well-known time lag from idling to full power. In this case it's about ten seconds. But from 65 per cent to 100 per cent it takes only about four seconds—approximately the same as a piston airplane.

Holding so much power on approach seems extreme to a piston pilot. But Cessna engineers have seen to it that this seemingly excessive power will not flatten out your approach too much. When the speed brakes are out and the throttle retarded to 68 per cent, attenuators are activated. These are nothing more than spoilers which move out into the jet exhaust and spoil the thrust. The effect is the same as having the throttles at idle, with none of the disadvantages.

One word of caution about the fantastic brakes on this airplane. As I settled on for the first landing, Bob warned me several times about going easy on the pedals until I could feel them. I soon found out why such caution was advisable. The T-37 has an extremely wide tread on the main gear. But the wheel base (distance from a centerline through the nosewheel to a centerline through the main gear) is quite short. If you get too much pressure on one brake the plane has a disconcerting way of darting in that direction. The first thing you know you're zig-zagging from one side of the runway to the other. It pays to use the brakes gently until you're sure the pressures are pretty well equalized before bearing down on them.

As we taxied in, I suddenly questioned, "How does this thing fly on one jet?"

"Oh, nuts!" Bob exploded. "I meant to show you that. Let's take off again."

On this take-off, about 100 feet off the ground, Bob cut an engine. If I hadn't expected it, I don't believe I'd have noticed, except for a slight falling off in airspeed. In most twin-engine planes, under this circumstance, there is usually a strong yaw and considerable rudder pressure is required to hold a straight course until one can get trimmed out.

As we started around the pattern, the tower asked us to hold south of the field while several small planes and an airliner came in. I had been descending with reduced power and my first thought was to get the boost on again while I still had some altitude. I soon had to reduce it, though, for I was gaining more altitude than I wanted. Four or five minutes later, the tower cleared us and we went in for an entirely normal landing.

As we taxied to the factory, I asked Bob if he had cut the engine or only throttled it back. He grinned, "It was stone cold dead all the way around, during the landing, and still is dead while we're taxiing." If for no other reason, this would make me a great jet fan. Incidentally, the T-37B has a single jet service ceiling of 25,000 feet. The 407 has a single-engine rate of climb of 745 fpm and service ceiling of 25,200 feet.

The T-37B was not as quiet as one might expect from reading of commercial jets. With the hard hat and ear phones, it was difficult to evaluate the noise level. However, it all seemed to be wind noise and was apparent because no effort has been made to quiet it down. You can bet this will not be the case with the 407.

Although Cessna is showing the 407 mockup and making presentations on its performance, they are making no promises as to when the airplane will be available. Actually, they're saying nothing about its future. One important factor, I'm sure, is whether the military will buy. This could speed up the commercial presentation immeasureably. END

Ghost Town

(Continued from page 67)

Nevada said there are about three times that number existing. Additionally there are many semi-ghosttowns and historical settlements which at one time were booming mining or cattle centers with populations in the thousands. Today, a mere handful of persons remain in the aggregation of ancient buildings.

Towns of outstanding notoriety in this category are Virginia City, Nev.; Central City and Cripple Creek in Colorado; Tombstone, Ariz.; and Bodie, Calif.

Our trips to these places seem never to get planned too far in advance. Typical of this was the recent trip we called the "Wyatt Earp Special."

One day a friend, Arnold Kish, and I got on the subject of Wyatt Earp and his work at Dodge City, Kan. We were both curious as to how much distance Earp covered when he patrolled Front Street of that roaring old cow town.

We decided to wind up my Super Cruiser and visit Dodge City and other historical towns in the area. As we packed our gear in the airplane, another friend, Mal Miller, came by and decided to join us. Not having enough room in my plane, we agreed to take Miller's Cessna 170. A utility, four-place airplane is excellent for traveling to and from most of the historical towns where some facility exists. However, for flying into and landing on the streets of ghosttowns high in the mountains, I prefer something like a Super Cub with tandem wheels.

We enjoyed a week of living amidst the atmosphere of the old west, learned enough about Earp to write several feature articles, and came back east refreshed and relaxed. We flew some 3,580 miles on this trip. Each took care of our own food and hotel expenses, and shared the aircraft operating expense. Cost to each was about $105. END

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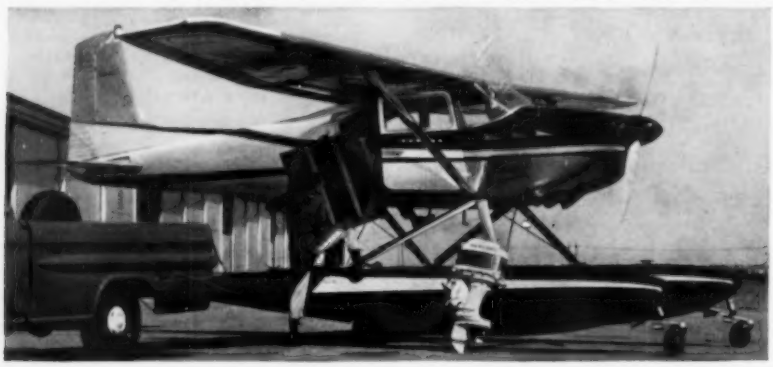

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Luscombe

(Continued from page 65)

characteristics.

Prior to take-off, the magnetos are checked at 1,500 rpm; carburetor heat is checked and pushed to the "Off" position; the trim control, which is located between the seats, is set to neutral, and then a static run-up check can be made.

When squared down the runway and the throttle fed in, the Luscombe 8-E accelerates in a matter of seconds. With the stick in neutral, the tail comes up and the airplane begins to get light. A little back pressure on the control at this time will get the airplane airborne with a minimum ground run. When airborne, the feeling is solid. The 8-E climbs out near 800 fpm at 72 mph; with the throttle backed off a bit to lower the manifold pressure several inches, the rate of climb is about 500 fpm.

When trimmed for cruise, there is good longitudinal and directional stability. In stable air the 8-E can be set on a course and left on its own. It will hold a heading fairly close, needing slight correction only now and then. With a standard pitch metal prop, it cruises an honest 105 mph at 2,300 rpm (75 per cent power would be about 2,350 rpm). Fuel consumption is close to 5.5 gph at this power setting. The Luscombe 8-E is redlined at 145 mph (true), normal operating speed is from 48 to 122 mph.

When maneuvering, the Luscombe responds well to moderate pressures. It rolls well and steep turns are easy to execute. In power-off glides at 70 mph and even at 60, control response is very good.

With power off and the nose pulled up, the Luscombe 8-E begins to buffet about 50 mph. The nose begins to fall through at 48 mph. The stall is gentle, and recovery starts immediately as the back pressure on the control stick is released.

Service ceiling for the 8-E is listed at 16,500 feet. At 12,000 feet, I have found that the 8-E starts to get sluggish in climb, and the rate drops to about 200 fpm.

To land, an approach speed of 70 mph is set up with carburetor heat "On" and throttle backed off to the "Closed" position (remember to clear the engine frequently when in the glide). Flareout is started about five feet above the runway and progressive back pressure is added to the control stick as the Luscombe settles through the ground cushion. Touching down on well-packed turf, the airplane will roll about 500 feet.

If you wish to relieve pressure on the control stick during the glide as I do, trim is cranked in until the airplane just about holds its own glide. If you do use trim for this purpose and find you have to go around again, be sure to hold forward pressure on the stick in the climb-out until trim can be readjusted.

In construction, the 8-E is built with some of the same design as an airliner. Its wing, for example, is all metal with stressed skin. A single wing strut is used, and all the control surfaces are metal. It has a shock-mounted instrument panel, full electrical system with controllable

(Continued on page 92)

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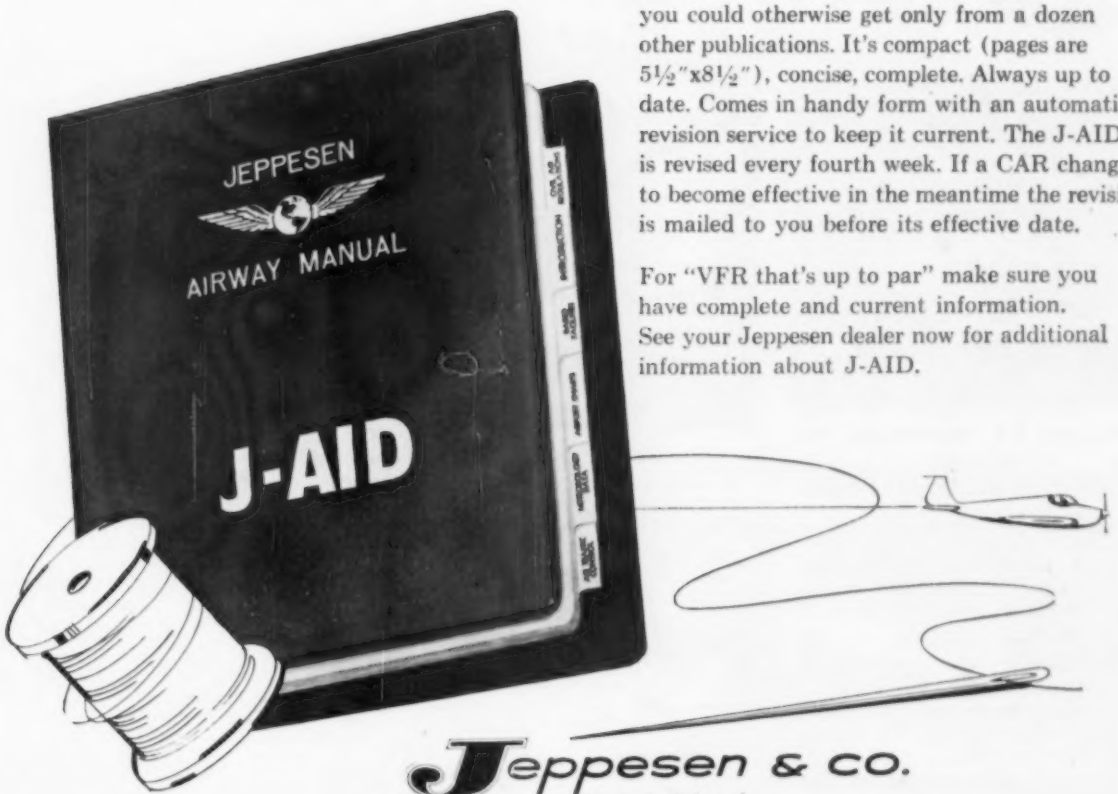

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(Continued from page 90)

panel lights, navigation and landing lights.

Empty weight of Kardos' 1946 Luscombe is 850 pounds, with a gross weight of 1,400. Normal baggage allowance is 75 pounds. Wing span is 35 feet and the overall length is 20 feet. Power loading is 16.5 pounds per horsepower, and wing loading is ten pounds per square foot.

"How about maintenance cost on your Luscombe," I asked Jim. He thought for a second or two and then replied that it has been very nominal due in part to a preventive program which he follows.

"For example, I check the tail spring bracket regularly. If it were to break, the bottom of the metal rudder could be damaged when it hit the ground; also I check the adjustment of the mechanical brakes frequently, and keep all hinges and pulleys lightly oiled."

"Are there any features that you don't like about your 8-E, Jim?" I queried.

Kardos replied that there is nothing major and he thinks of the Luscombe as a "well built, strong airplane," but there are two or three minor points. The first is that the airplane is a little snug for two 180-pounders sitting side by side. Also, as in the case of most light aircraft, the cabin heater does not supply enough warm air in cold weather.

The third point is that, since the engine is tightly cowled, it can overheat if run on the ground for a period of time during summer weather. I mentioned to Jim that I also experienced this, several years back when I owned an 8-F model, and landed at a busy, controlled airport. By the time I taxied far around to my take-off point again and awaited my turn to go, the oil temperature was in the red and I requested permission of the tower to pull to one side to cool down the engine.

Kardos said he found that by adding some ¾-inch extension to the original bottom cowling, oil temperatures can be lowered between 15 to 20 degrees.

Several models of the two-plane Luscombe are still in use. Most frequently seen of the Luscombe line are the fabric wing, metal fuselage, model 8-A which is powered with a 65-hp engine; the T-8F "Observer," a two-place tandem, all metal former military liaison airplane; the all metal, Silvaire Deluxe 8-E; and the 8-F which is similar to the 8-E except that it is powered with a 90-hp engine and may or may not have flaps.

Depending on engine and airframe time, equipment, and general condition, prices being asked for Luscombes are as follows: 8-As from $1,100 to $1,900; 8-Es from $1,900 to $2,600; T-8Fs from $2,000 to $3,000; 8-Fs from $2,200 to $3,500. END

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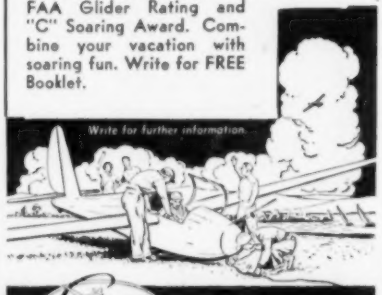

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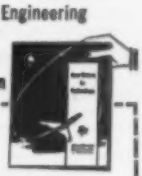

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Automatic Flight

(Continued from page 52)

trols may be at any convenient place on the instrument panel.

I know some pilots have mistaken ideas about how much an autopilot can do. As far as navigation goes, all an autopilot will do better than you is to hold a heading. It will not find the omni station. Neither will it take winds into consideration to make good a predetermined track. All it will do is fly the airplane just like another pilot sitting alongside you who knows nothing about navigation, proper altitudes, etc. You have to provide all the proper navigation information. Undoubtedly most manufacturers are working on new gadgets to supplement their present equipment and they will cost you extra money but will probably be worth every cent of it.

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(Continued on page 96)

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ARM-203A	618S H.F., less disable switch	ARM-211A	51R/51V-3 VOR
ARM-205A	17L-3/51R-3 VHF Communication	ARM-211A	51X-2/51V-3
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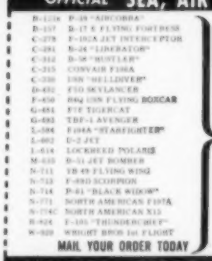

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(Continued from page 94)

a new altimeter setting, you will have to turn off the altitude hold, acquire proper altitude and then push the *hold* button again. With the approach coupler you acquire the glide slope and localizer by flying in the vicinity of the outer marker on a heading somewhere near the localizer inbound heading and then push the button. Bingo! You're right down the slot. A few minutes later, there's the runway right in front of you. Real nice if you can afford it. The Dynavia omni coupler will take hold on a selected omni track and take the plane right to the station or keep it on a radial outbound from the station. I have not been able to find out what happens in the zone of confusion over the station, but the fellow who designed this is very clever and I am sure he has made some provision for preventing the airplane from following the omni needle under these conditions.

I'm sure that readers interested in single axis systems will now be better prepared, as a result of reading about two- and three-axis autopilots, to make a decision to go single-axis or full autopilot. For those that by reason of economy or shorter flight requirement believe that the single-axis system will meet their needs, the following analysis of the Lear Arcon, Piper (Mitchell) Autocontrol and Tactair Levelair is included.

It is not uncommon knowledge that the Piper Autocontrol is manufactured by Mitchell and is, for all practical purposes, the Mitchell autopilot minus the pitch axis system. Together with Tactair's Levelair, it uses both DG and artificial horizon but no rate gyro. Lear's Arcon uses a rate gyro, however, a directional control accessory is available at extra cost. It is the DG of the L-2. The rate gyro of the system is retained when the directional accessory is added. Piper's Autocontrol uses the frequency shift principle of the Mitchell Autopilot, Lear has the 400-cycle system of the L-2 for the Arcon but transistorized the entire amplifier and Tactair employs the pneumatic system of its two-axis autopilot. So again we find as many basic principles of operation as there are manufacturers.

Single-axis systems, unlike autopilots, do not seem to be readily available, as installed items, for demonstration purposes. Perhaps the dealers think it will be too difficult to recover the cost when they sell the airplane.

The major difference between the single-axis system is that some control rudder and some control ailerons. Before you go out for a single-axis demonstration determine if your airplane will recover from turns with rudder or aileron alone. Don't expect a coordinated maneuver. You won't get it except in a Tri-Pacer or Bonanza. All three systems make nice turns with a bank angle of from 20 degrees to 30 degrees and the maneuver will be smooth if you don't command the turns too rapidly but ease in and out of them gently.

Lear's Arcon is a powerful system and uses a servo with much the same characteristics as those of the L-2 autopilot. It did a nice job of controlling the Bo-

(Continued on page 98)

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(Continued from page 96)

nanza during the take-off run and landing roll with feet on the floor. It even steered while we were taxiing. Lear has it certified this way and you can legally use it—but me?—I'll wait until I have a little altitude. Piper and Tactair both have the advantage of operating from displacement information as well as heading error. If a wing drops it will come up before any turning motion develops. The Lear Arcon would have to detect a turning motion first but, in all fairness, it would be a mighty small one.

I tried several spiral dives with each of these units. Both Tactair and Piper stop the turn as soon as they are engaged. The Lear Arcon has a trim motor in the system that works much like that in the roll axis of the Federal autopilot. If the turn has been in progress for an appreciable time before engagement, the motor will have adjusted itself to the attitude of the airplane and will require a few seconds before it brings the wings level. However, with the Arcon, you are more likely to have it on before the spiral begins since, once the master is turned on, you have to press a button and hold it down to keep it disengaged. So you're usually flying with it on. The Piper and Tactair are manually engaged and have to be manually disengaged. Any of the three can be overridden to produce a turn but the Lear unit will start you back to the heading you were on when you let go of it. So will the Piper and Tactair if the DG is being used. The best way to make turns with the Lear Arcon is to use the trim knob. Besides I don't think that overriding the clutches helps it any and it takes too much effort.

Controls for these single-axis systems are much simpler, of course, than for a two- or three-axis system. A master switch is usually provided to turn them on and off. The Lear Arcon is on and engaged after the master is turned on, unless you hold down the button on the wheel. The Mitchell has a Turn knob next to the DG and a push-pull handle for engagement and is also equipped with a trim knob. Tactair has a small engagement button on the control head.

If you're strictly a VFR pilot out for the fun of the ride I think the single-axis systems have a lot to offer when you consider their price and the fact that they give you a safety factor if you get caught in instrument weather. Even without a DG they hold a heading pretty well and in good weather can give you that extra leisure that can make flying a lot more enjoyable.

As important as the original choice of an autopilot is how and when to use it. My recommendation is simple—as much as possible. Engaging immediately on reaching placard altitude will relieve you of the need to monitor the aircraft attitude and free you to watch for other traffic at a time when watching is most important. As you make your departure turns, you will really appreciate this feature. By setting up your best climb attitude immediately, it will be maintained throughout the climb and you'll reach your cruising altitude quicker and more economically. You also have more time to set up and monitor your power set-

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tings. As mentioned previously, the system won't damage your airplane in rough air, but if it is a high performance airplane it should be slowed to a safe speed and rough air is where you'll appreciate your equipment the most. During descent and approach you'll appreciate advantages similar to those you had during take-off and climb. Don't forget, though, you're maintaining *attitude* with an autopilot and, as you descend, the air gets heavier and lift and power are increased. Readjustment of power and attitude will be necessary if you are to descend at a constant rate. As you approach the field, let your equipment fly the airplane and take time now for a leisurely check of the aircraft's configuration. Landing gear down, flaps set, trim setting, fuel selector position, electrical switches, etc. You've just never had it so good. As you enter the pattern, you have plenty of time for observing and avoiding other traffic and, as you turn final, she's all set up without any hurry. Flip off the automatic flight system and take it in for a smooth landing.

A word of caution to would-be purchasers of automatic flight control equipment. Be certain that the dealer from whom you purchase it is willing, qualified and equipped to service your system after it is installed. If not, he should make arrangement with a qualified service agency for the warranty repairs and periodic service you will need. You just don't install these things and then forget them. For all they do for you, they're worth their weight in gold, in fact, that's what it may cost you. But they all need service, just like any other part of your airplane. When all else fails with your dealer or distributor, let the factory know your troubles. They will hasten to remedy the situation. Usually they do the right thing and often more than can be reasonably expected. They are all sensitive about their reputation.

The lack of any previous mention of the Sperry SP3 autopilot is not discriminatory. This article was written prior to Sperry's announcement of the SP3 and it was not yet in production when this article went to press. Sperry has a combination direct current and AC system and the engineering philosophy here is towards a building block system wherein the owner can add a second- or third-axis to an existing system. I have not had the opportunity to evaluate the SP3 in flight but I would suspect that it has many similarities to the Lear L-2. It is an electronic system completely transistorized with many unique features in construction and serviceability and the author has arranged for a complete flight and technical evaluation at the Sperry plant which will result in a separate article in a future issue of this magazine.

With reference to the future of automatic control systems for business aircraft, it would appear that the systems mentioned in this article including the Sperry SP3 are going to be with us for a considerable time. There are a large number of research and development programs that are under way, but the equipment that will be developed from these programs will be designed primarily for

(Continued on page 100)

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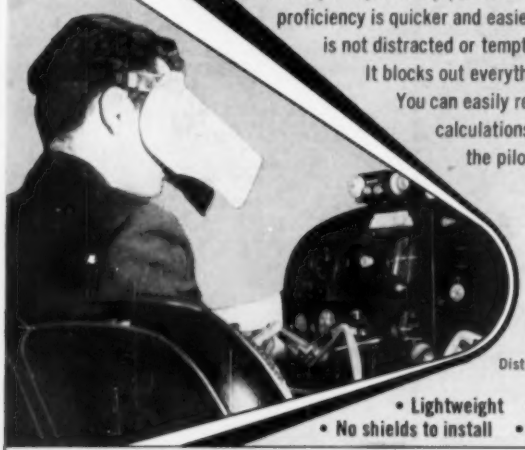

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(Continued from page 99)

military, airline and large corporate aircraft. The refinements that result in lighter weight and higher reliability will eventually filter down into products designed for the smaller business aircraft, however, these are many years away at this time. It is not likely that equipment purchased from those available on today's market will become obsolete in a short time, if the development-use cycle of aircraft and components exhibited over the past 20 years is any criterion.

Because of the many items of equipment to be flight checked for this article, I doubt if I'll ever write another that will be as difficult or take as much time. It wasn't possible to visit all the manufacturers, so I had to impose on some distributors who were cooperative. Lear is close and graciously provided a Bonanza with an L-2 and an Arcon installed—both in the same airplane, no less. Norman Larson, Beech Distributor at Van Nuys, Calif., was kind enough to furnish a brand new 1959 Bonanza with a Tactair installed. Equally cooperative was General Aviation Supply Co., which furnished a Mitchell equipped 182 when I was in the Phoenix area. They distribute the Mitchell in a sizeable portion of the U.S.A. And of course, my thanks to ITT which supported me while I became familiar with its Federal Autopilot. END

Lockheed

(Continued from page 48)

Antarctic within the same generation in which the airplane was born by a flight of 120 feet, we may get some concept of the grubbing and the rooting and the living and the dying that the aircraft industry had to endure within so compact a span of time.

What was true in the technological sense was likewise true in the area of financing and management. The aircraft industry was not yet provenly essential to government as a major source of security: not even as a logistic tool to serve the business economy of the nation. The industry was furthermore uniquely inarticulate. How was management to project as much as a two-year market forecast? At what point could institutional financing be expected to enter the picture? How big was the insurance problem? At what rate could aircraft be depreciated? To what extent was government regulation helpful and advisable? From what educational sources could skilled labor be recruited?

If management decided on the wrong airplane to produce, the company was a dead duck. If . . . if . . . if . . . the uncertainties were everlasting and there were no precedents. The job of management required a stubborn will, a quick mind, an understanding of people and finance and, if a good crystal ball was handy, that helped too. The one ingredient sure to be lacking was money. Nobody who ever, at any time under any circumstance, designed and built an airplane had enough money.

Gross and his team in the next year and a half made about the one move that

could pry the company out of its dilemma —they designed, built, got advance orders for, and somehow managed to finance the Electra, a twin-engine, twin-tail, all-metal, ten-place, transport. The wing span was 55 feet, the gross weight almost 10,000 pounds. The plane could outleg its competition and was as much of a star in the early transport firmament as its predecessor Vegas et al had been.

The Electra brought not only rejuvenation to Lockheed—it brought Clarence "Kelly" Johnson, who in effect was a sort of added insurance that dynamic engineering would be a continuous condition with the Gross enterprise. It came about as follows. A scale model of the projected Electra was sent to the University of Michigan wind tunnel for testing and an adverse report on the sufficiency of the rudder came back from a young graduate researcher named Johnson. Hibbard was impressed and Johnson was persuaded to come to Lockheed where his first job was to redesign that tail which now became a twin.

The Electra concept, of course, had been born in principle when Stearman, Varney and Gross formed their company before purchase of Lockheed. That the group did not rest on the laurels of the single-engine stellar line of Lockheed was rather remarkable, for those planes never ceased making headlines. Gross and his regime had a built-in publicity apparatus which was unbeatable. Squier did not need a demonstration Electra to sell the projected transport. He just reassured the market that it would be a bigger, faster and safer Lockheed. Amelia Earhart, Wiley Post, Kingsford Smith, Benny Griffin, Jimmie Doolittle and others were sort of automatic John the Baptists for the Electra.

Squier had orders for about a quarter of a million dollars worth of Electras before the prototype ever flew and, underpriced badly at something less than $40,000 per ship, that came to a lot of Electras. Pan American and Northwest Airlines were the first two carriers to order them. When the original Electra went out of production just before WW II, some 150 of them had been built and sold.

The detail of how Bob Gross, and all the rest of the outfit scrounged for cash and peddled bits of stock and borrowed here and there and lived from hand to mouth to finance the Electra development would make a rare bit of dramatic history for a financial magazine. One happy exception we might mention was that, in all the mad rush of those days by institutions to escape aviation financing, Lockheed found a fellow spirit who headed an Investment Banking business in Los Angeles—G. Brashears & Co. Mr. Brashears underwrote Lockheed stock at a time when it counted, i.e. in 1933, and over several subsequent years.

Significant personnel changes occurred in these times of stress as might be expected. Walter Varney sold his stock and retired from the Board of Directors to devote all his time and money to his airline business. Lloyd Stearman resigned as president to get back to his first love—designing. Robert Gross became Presi-

(Continued on page 102)

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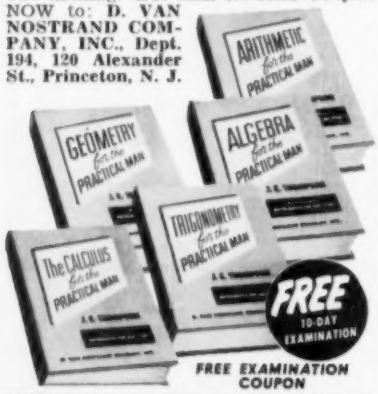
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(Continued from page 101)

dent, Treasurer and Chairman of the Board (the titles resemble one of these foreign government set-ups where the big boss wears many hats). Hall Hibbard was made vice president and Chief Engineer. Carl Squier went on the Board of Directors. Courtlandt Gross, Bob's younger brother, who had been associated with him at New Haven, started on his way to the ultimate presidency of Lockheed by becoming the company's liaison officer on the east coast—a New York office.

It would be an impossible task to enumerate personalities, even key ones, as they entered the Burbank scene in one special capacity or another. During the early months of the Gross regime at Lockheed, everyone on the payroll, regardless of his title, was a jack-of-all-trades. The important thing which was transpiring was that a company character was being formed, a philosophy generated, a policy established.

From the basic design of the original Model 10 Electra, two other aircraft were evolved—the smaller six-place Model 12, introduced in 1936, which had a production run of 114 units before it faded in face of war pressures; and the larger Model 14 Electra, a 14-place midwing transport of 65-foot wing span, Fowler flaps and a pair of Wright Cyclones to pull it along in excess of 250 mph. Both ships were notable, the "12" as an executive plane which met business needs and to which tricycle landing gear was once adapted by special modifications. I am under the impression that the 12 was the first modern tricycle gear aircraft to be landed on an aircraft carrier. Navy did order some of the 12s, as of record but I do not know where verification that one of them landed on a carrier could be found.

Previous to the advent of the 12, Lockheed had sold exactly one handful of planes to the military service, five Model 10 Electras for staff transport. And factually, I doubt that, when test pilot Marshall Headle and Kelly Johnson took the Model 14 off in mid-summer, 1937, either they or anyone else at Lockheed knew they were launching one of the militarily significant planes of all time—the aircraft which was to go to war as the British medium recon-bomber, the Hudson, of which Lockheed was to build more than 3,000 before the plane exhausted its potential for the defense of the free world.

But before we touch further on that subject, we should record an interim step in the evolution of airpower, civil and military, in which Lockheed was the key figure. We previously remarked that Wiley Post in his high altitude tincan suit was the first to look like a man from Mars. In mid-1936 the Air Corps, knowing that airpower had to push to higher altitudes for greater effectiveness, gave Lockheed a directive to come up with a pressurized version of the Electra as a research ship. The XC-35 resulted and with its ten pounds per square inch capability of pressure differential, proved so valuable as an experimental tool that it was adjudged the top aeronautical development of the year and awarded the Collier trophy. From that day forward, man began to anticipate overflying the weather in substantial degree and was on his way to the stars.

It has been said that Lockheed was shot with luck to get the British order, largest in air history till then, for 25 million dollars worth of airplanes—the initial order of 250 Hudsons and spares had that price tag. But that's a half truth. Lockheed got in line for its luck when it made the right decision to build the Electra and

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then an even faster and bigger Electra. It assured its luck when it developed a production force of great dedication and loyalty. It reassured its luck when its engineering force was ready, willing and able to make immediate and effective modifications. Its people were its luck—the British liked them. It took all of these things in combination to swing the deal. Maybe the British purchasing commission even knew that Chamberlain and his umbrella had flown to see Hitler in an Electra 10 and thought it thus would be appropriate for the RAF to make subsequent visits in an Electra 14.

It is almost impossible to estimate the magnitude of fulfilling such a firm order as the Lockheed contract team headed by Courtlandt Gross brought back from London—200 Hudsons certain and up to 250, if Lockheed could produce that many prior to the end of 1939. Remember that at this time aviation was still small business, and a mere five years had passed since Lockheed had been no business at all. Additional to the military order, both the 12 and 14 were multiplying the demand for themselves as civil transports. Gross faced the job of raising enormous working capital, of immediately more than doubling his plant capacity, of establishing a training program for quadruple the number of his existing employees, and of letting the first major subcontracts in the history of aviation manufacture. And all of this against a deadline!

That it was accomplished almost two months ahead of that deadline was a fact that fixed the Lockheed reputation firmly in the minds of not only British but United States leadership, and turned the company from a small into a big business. Many notable individuals were recruited to the firm at this time, one of them being C. A. Barker, Jr., a banker who shared the matter of financing with Gross and later became one of the 'wheels' of management, the Senior vice president, in fact.

I was in Germany on certain matters during parts of these several years and have often wondered what would have been the historical result if the British order to Lockheed had been made and executed with such dispatch prior to Chamberlain's visit to Munich. If someone had snapped a cap pistol when Hitler marched into the Ruhr originally, Hitler would have marched right on out again! Hitler throve on the moral compromise of the free world. Those who tried to persuade him against conquest and, believe me, there were a powerful lot of such in Germany, had no ammunition to use in argument, ammunition such as Lockheed's power to create armament in time and on time. I'll not forget Goering's explanation to me of his great accumulation of Ju-52s. (The airwise will recall that the Ju-52 was a workhorse transport, dependable, slow, high lift—stodgy but efficient, as so many German contrivances are.)

Goering, whom I had known since WW 1, explained that, since it was practical to convoy ships at sea and trains on land, it also would be practical to convoy

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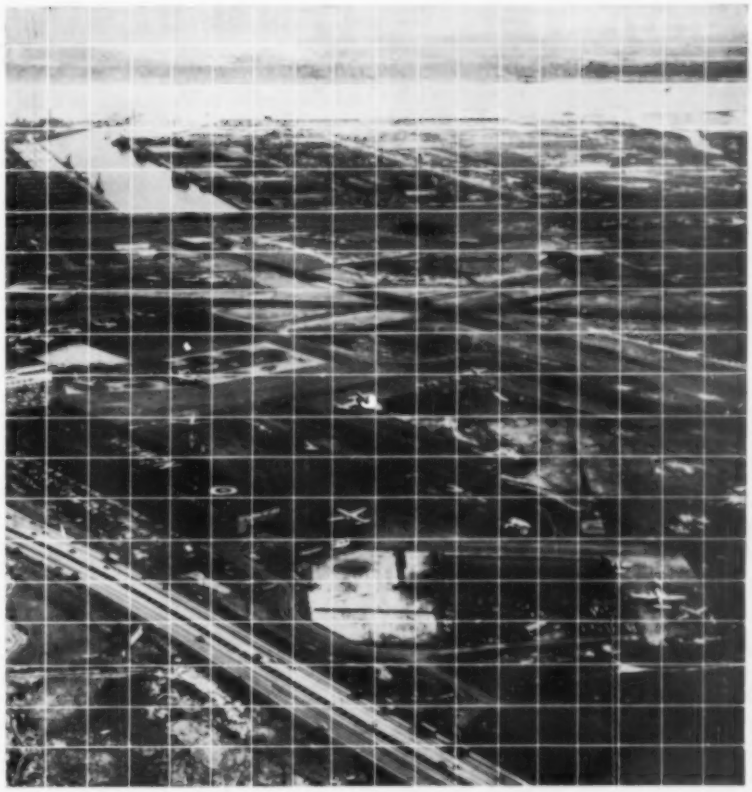

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(Continued from page 103)

bombers to their destinations—that it was fallacious and wasteful to think of arming them when fighters could give them much better protection than they could themselves furnish.

I thought originally he was pulling my leg; and that the Junkers were more likely troop carriers since they had great tactical ability. However, sure enough, Ju-52s eventually appeared over Britain with bombs in their bellies and were sitting ducks despite fighter protection. Heaven only knows how many of them were shot down everywhere from Northholt to Norway to North Africa. But the point is not that the theory of using the "52s" was so silly. The point is that by this idea Goering showed a complete contempt for the airpower of the free nations to effectively resist even a lumbering barnstormer. And nowhere in the air industry of the democracies could he find an example of capability to deliver an honest airplane in time to thwart him. It was a fact that the peanut bill in the United States was more than the aircraft manufacturing bill when Chamberlain went to Germany for "peace in our time." Nobody had demonstrated what our aircraft industry could do. Germany believed the wrong advice and that was it—war.

In my humble judgment, Khrushchev is smarter. He at least has a suspicion of what the American aircraft industry has up its sleeve. Its great history of ability to come through is a powerful facet of world peace. If our political leaders are thoughtful they will keep that fact clearly in mind.

Completion of the initial Hudson contract was followed by re-orders, without intermission. And now so many developments happened contemporaneously that the isolation of each from each is almost impossible. Lockheed set up a subsidiary to develop another small executive plane, a project sparked by Al Menasco's design of a powerplant composed of twin engines turning a single propeller. The prototype performed well but the project just didn't have enough priority to survive. The one thing that did survive was the subsidiary, Vega Airplane Company, so called to keep alive within Lockheed the name of the famed plane.

The most significant project of the day (1937) was Army's conclusion that it would need an intercept fighter to go high, fast and far and possess twin-engine reliability. There was some indication that the United States eventually might be defending itself both on the North Atlantic approaches and in the Pacific northwest. The aircraft industry was asked to sink its teeth in a fighter design that could go to sea and come back from distant combat. Lockheed's design, to emerge as the famed P-38 Lightning, and to be used by both British and Americans around the globe, was approved by the Air Corps.

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lems of compressibility. Lockheed licked them in the P-38 with dive brakes but this was a phenomenon to stew over in all future high performance aircraft.

Meanwhile the demand for civil transport surged ahead and Howard Hughes added to Electra fame by circumnavigating the globe with phenomenal precision. Hibbard and Johnson blew up the Model 14 into a larger faster transport which was named the Lodestar. Officially the Model 18, this plane had a cruising capability of some 230 mph with 17 passengers. Squier invited me to ride along on a demonstration tour of the Lodestar. Nothing in the civil transport field could match its performance. Lockheed began to set up a series of service stations around the globe to augment its farflung sales force. If I remember correctly, at this time the civil transports of the Electra family were the most widely spread internationally of any aircraft type in existence.

Nor did Lockheed even pause with the development of the Lodestar. Bigger—faster—longer range—were the watchwords of the front office. If you pause in this business, you drop dead. The public was starting to ride with some degree of confidence. Hibbard, Johnson and their confreres began to think in terms of four engines. The Douglas DC-4 was in the works. Twin engines seemed comparatively relegated to short haul operation.

Having considered a whole series of projections, Lockheed wound up ultimately with the original concept of the Model 49 Constellation—a 50-place transport with excess power to lift, climb and cruise around 300 mph; and gross at some 70,000 pounds. At first the design was called the Excalibur, just as the Model 14 had been called the Sky Zephyr but the name Constellation seemed far more appropriate. TWA had sponsored the origin of the DC-3, and executives of that airline had much to do with the final decision of Lockheed on the Model 49. Howard Hughes and Jack Fry wanted nothing less than four engines, cabin pressure for altitude cruising and trancontinental range. This pattern also fulfilled the ambition of Pan American and other customers, so it was decided upon. The Electra family was no longer the main interest on the civil production line—for the first time since the Gross regime took over at Burbank. And even Burbank itself was radically changed. Lockheed had bought the Air Terminal and great adjacent acreage and was no longer a tenant but a landlord of expansive holdings.

However, despite Lockheed's fixation on the main theme, civil transport, fate intervened sharply. Pearl Harbor exploded in the face of civilization and the Connie was out of order in war production scheduling. Lockheed produced a score for special purposes of the military but that was it. Their designation varied but mostly was C-69. Connie had to await VJ day to come into her own.

Nothing short of a library could detail the Lockheed war effort. The company provided almost a tenth of the total production of military aircraft in the United

(Continued on page 106)

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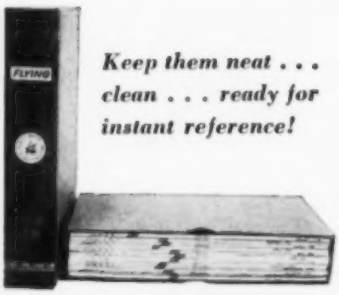

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GEM AIRCRAFT, INC.

Rexburg, Idaho

(Continued from page 105)

States—in excess of 10,000 P-38's, 3,000 Hudsons, 2,600 Harpoons and Ventura PVs, a Navy adaptation of the tough Vega Ventura, 2,750 B-17s, and fulfilled a kaleidoscopic range of modifications and special projects.

When Pearl Harbor was hit, the company already had more than 54,000 employees on the payroll and ultimately more than 94,000, of whom some 40 per cent were women. Recruiting special skills on a national basis led to employment experience never before duplicated in industrial history. The mere job of putting the vast plant space under camouflage involved an expenditure of hundreds of thousands of dollars.

The total result industry-wide was dubbed a miracle but it was that only in the sense that the people involved rose to exceptional heights of character, devotion, ability. Perhaps mankind is better than he thinks, but he never is impressed until some crisis highlights his stature. Men and women at their best always seem miraculous in contrast to men and women uninspired. Such a detail as just getting 94,000 people to work under war conditions of gas rationing; and of taking care of children while mothers drive rivets; and of finding a cadre of dwarfs to crawl into restricted quarters in an aircraft wing—these are the details of which miracles are made. And they are possible of making only as the management of a company has built soundly in philosophy as well as in engineering; soundly in the human values of supervision as well as in the technical.

I doubt that civilization has seen in the self discipline of civil life any work of art more notable in achievement of human relations than that represented by the aircraft industry of the United States in WW II. Nor was there a better example than Lockheed. In fact the whole show was so good that millions of men and women looked back at it in postwar days and believed the more firmly in the potential of mankind for democracy and in free private enterprise as a way of life.

The American people could well have lost their heritage of spiritual and intellectual values in WWII—it was a bloody show with little humor and no songs. But they didn't. Such men as that little group who gathered in the Los Angeles courtroom to buy a bankrupt aircraft company because they believed in something bigger than themselves are the historic reason.

The United States is a land in which men have shivered at Valley Forge, or died at the Alamo, or stood in an infinite variety of places where the only nourishment of their hearts and minds was faith that, if they dedicated themselves to a great ideal, they themselves could become great.

It was no different with Lockheed and the aircraft industry in the hours of the nation's trial than it was with the pioneers of other days. They had a faith. They had a skill. They were ready.

What came of the move of Lockheed into the jet age and ultimately into the era of astronautics, we will pursue in the next issue of FLYING. END OF PART II

FLYING CALENDAR

March 24-26—Fourth National Conference on Aviation Education at the Brown Palace Hotel, Denver, Col. Conference Comm. Ch., Dr. William Hinkley, Supt. of Schools, Aurora, Col.

March 29-31—Second Annual convention of the National Association of Flight Services, Leamington Hotel, Minneapolis, Minn. Theme: "Make profits soar in the Soaring '60s."

April 2, 3—Private Aircraft Trade Fair at Ryan Airport, Baton Rouge, La. Free breakfast to pilots who fly in on April 2. Write: UHS Key Club, Univ. Sta., Baton Rouge 3, La.

April 14-24—Los Angeles International Air and Space Exposition at Los Angeles Memorial Sports Arena. For Information, write: Charles H. McLaughlin, Sr., president, Suite 519, 1717 N. Highland Ave., Hollywood 28, Calif.

April 20-22—Annual meeting of Aircraft Electronics Association at Hotel Sir Francis Drake, San Francisco, Calif.

April 23—Tribute Dinner to Famous Flyers at Statler Hilton Hotel, Los Angeles, Calif., sponsored by L. A. Air & Space Exposition, Suite 519, 1717 N. Highland Ave., Hollywood 28, Calif.

April 28-30—Washington State Apple Blossom Festival Fly-In, at Wenatchee, Wash. Parade April 30 with Fly-in Breakfast and free transportation from Fancher and Pangborn airports.

May 1-4—Annual meetings and news conferences, Aviation Writers Association, Ambassador Hotel, Los Angeles, Calif.

May 1-5—Tenth All-Woman Air Race from Miami, Fla., to San Salvador, El Salvador. Sponsored by Fla. Ch. of the 99's.

May 11-14—Sixteenth National Forum of the American Helicopter Society at Sheraton Park Hotel, Washington, D. C.

May 13-15—Spring Sectional Convention of 99's hosted by Houston Chapter at Shamrock Hilton Hotel, Houston, Tex.

May 13-15—Nineteenth Annual "Holiday on Wings" flight to the Grand Canyon. Contact: Bill Campbell, L. A. Jr. Chamber of Commerce, 404 South Bixel St., Los Angeles 54, Calif.

May 14—Sportsmen Pilots Handicap Air Race, from Air-Oasis Co., Long Beach Airport, Calif., to Las Vegas, Nev. Trophies, prizes. Contact: Thomas C. Buck, 13106 Galway St., Garden Grove, Calif. Phone: JEfferson 7-8635.

May 15—Annual Civil Air Patrol Air Show at Lee Airport, Annapolis, Md. Contests for pilots, sky divers, acrobatic flying and demonstration of new Umbaugh 18. Contact: Donald C. Parlett, ch., Edgewater, Md.

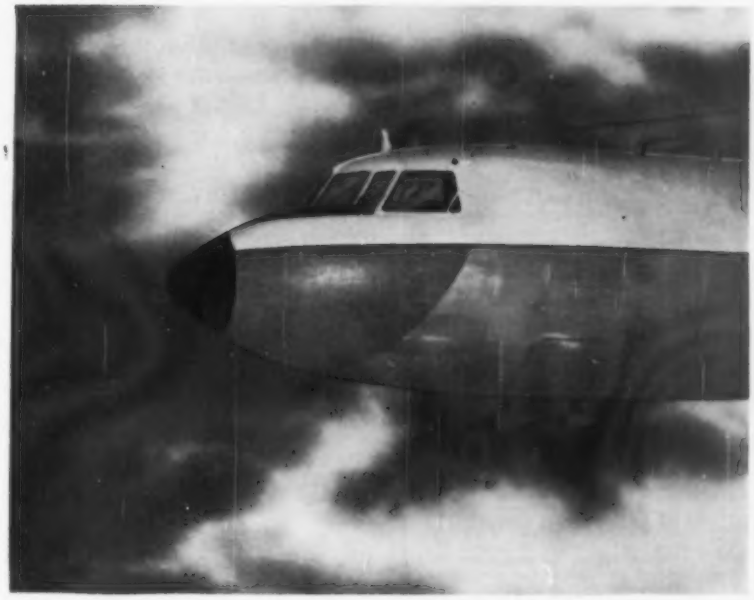
May 15—Fly-in Breakfast, 7:00 a.m. to 12 noon. Style show and "Penny-a-pound" flights. Sponsored by CAP at City Airport, Janesville, Wis.

May 15-18—Annual Conference of American Association of Airport Executives at the Waldorf-Astoria Hotel, New York, N. Y.

May 22—Annual Fly-in Ham and Egg Breakfast at Rock County Airfield, Beloit, Wis., sponsored by Beloit Composite Sq., CAP. Please bring your own tie-downs.

May 29—Aviation Day at Philadelphia International Airport sponsored by the City, the World Trade Week Committee and the Ch. of Commerce of Greater Philadelphia. Displays, demonstrations of planes and equipment.

Calendar items must be received at FLYING's editorial offices, 1 Park Avenue, New York 16, N. Y., three months prior to the event.



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I Learned About Flying

(Continued from page 71)

still several hundred pounds below our planned fuel.

Just outside of Nashville it became apparent that the weather forecast of isolated thunderstorms was wrong. The towering cumulus were spread out ahead as far as we could see, but there were valleys between them. We wove around the clouds for several minutes and then came to a thin overcast slightly below us.

It would have been easy to get an IFR clearance and go above or through the weather, but regulations required that all ferry flights be made under VFR conditions. The leader had no alternative but to start a slow descent to get under the overcast in order to remain VFR.

As we slid under it at 28,000, it became apparent that the overcast was gradually lowering. So we continued a shallow descent.

In the meantime, the thunderstorms were causing trouble with the radio reception in both aircraft. We were unable to pick up Cincinnati and were flying "Time and Distance" until we got closer.

As the clouds forced us down to 15,000 feet, my fuel warning light came on. That didn't mean any serious problem, except that we would have to land and refuel before reaching Detroit. We both had realized this when we first started the descent.

I notified the leader of my fuel situation and he immediately decided we would turn back and land at Louisville. We both tuned in the low frequency range there, and made a turn toward the station. By this time we were down to 8,000 feet, flying between cloud decks with only occasional glimpses of the ground. There was still no serious problem, it seemed.

But the leader decided to play things as safe as possible. The thunderstorms could be causing an erroneous reading on our radios. He called radar and asked for our exact position.

After the radar controller verified that he was tracking the correct aircraft by having us change signals with our transponders, he reported that we were over Cincinnati.

That didn't seem right, but there was a large city ahead of us. Maybe we had picked up an unusual wind and were farther north than we had figured. We both had used radar before as the only help available to get out of a tight spot. It had directed us around thunderstorms, helped us make landings in bad weather and given us flight following on cross-country trips. Radar had once directed me down through a 20,000-foot thick overcast to a safe landing after I'd lost my compass and all radio navigational aids while flying at night. Radar is almost always right, we reasoned, better trust the controller.

"Let's go into Dayton," I radioed the leader. I had enough fuel for the short flight between Dayton and Cincinnati, but it would be close. Also the nearest field with the 7,000-foot-long runways the RF84F requires was at Dayton.

He asked the radar controller for a steer to Wright-Patterson AFB near Dayton and we turned to a northerly heading while waiting for the radar directions.

When they did come it was a shock.

"Take a heading of 270 degrees," radar said. That was impossible, because Dayton is north of Cincinnati and he had told us just a few minutes before that we were over Cincinnati.

I heard the leader angrily tell the radar controller that his directions were wrong. He requested a new steer. It was easy to tell from the conversation that the controller was rattled.

By this time we were heading north and occasionally running through light rain showers. We were at about 10,000 feet with a solid overcast above us. Fuel in my plane was dangerously low and I knew the leader was in the same shape.

"Why not give Wright-Patterson RAPCON a call," I radioed to the leader. The Radar Approach Control at this base is known throughout the Air Force as a crack outfit.

He called RAPCON and got an immediate reply.

"We are south of you with a minimum fuel," he told the controller. "I'm squawking emergency."

That meant that the leader had turned his transponder to the emergency position which flashes an alarm on all military radar sets for easy identification and at the same time tells them there is an emergency.

RAPCON had us make turns for identification and then said to fly a heading of 150 degrees. We turned to that heading and asked how far we were from the field.

There was a long pause. Then RAPCON came back on the air.

"Ignore the previous steer. We have you confused with another aircraft."

At that time, we were passing over a tiny airport with paved runways, obviously much too short for our jets.

We continued to fly the heading previously given to us while the leader asked for immediate directions. All of the fuel warning lights were on in my cockpit. I was down to only minutes of fuel and I knew the leader was in the same condition.

Ahead of us was a solid black thunderstorm. We were getting no action from radar. We were fast approaching the time when we would have to either bail out or attempt a landing.

After a few quick words between us, we decided to attempt a landing at the small airport we had just passed and we made a turn in that direction.

We came in low over the airport which had three runways, all about the same length. A battered windsock showed that the wind was down one of the runways and, because I was lowest on fuel, we decided that I would make the first landing. Chances of stopping on the short strip seemed impossible, but a landing attempt was better than bailing out.

As I made my pattern, the leader flew close formation and checked that my gear was down. Glancing at my fuel, I saw that there wasn't enough to go around for a second landing attempt if I missed the first time. If the gauge was

wrong, I might flame out in the pattern.

I made my final approach longer than usual to slow down the plane. As I started my flareout, I cut the engine because I didn't want the jet thrust while I was trying to stop. As the wheels touched the ground, I pulled the lever to release the drag chute, and felt it start to slow the plane. At the same time, I applied full brakes. The runway was wet and I could feel the anti-skid brakes grabbing and releasing as the wheels went through puddles.

The jet started to swerve to one side and I had to release one brake to straighten out. Then it swerved in the other direction and I was on the brake again. But the plane was slowing. The end of the runway was coming up more slowly. It seemed that I would stop before I ran out of concrete. But there was too much momentum. The plane slowly went off the end of the pavement into the soft over-run and stopped.

I sat in the cockpit for a moment doing nothing, just thankful to have made a safe landing. Then I heard the whine of an approaching jet engine behind me. I scrambled from the cockpit as fast as I could move, fearing that the leader's plane wouldn't be able to stop. But as I jumped off the wing, I saw the other ship stop a safe distance behind mine. He had made a slower approach and popped his drag chute while still in the air.

The strip where we landed was 4,500 feet long, on a former Army base at Madison, Ind., 50 miles north of Louisville. Apparently we had been near Louisville when radar had told us we were over Cincinnati.

Our troubles had started when we were unable to receive Cincinnati radio range. They increased when we ran into unexpected weather and became acute when the weather forced us to low altitudes where a jet's fuel consumption is high. Then we got wrong directions from radar and were too far away from Dayton for accurate instructions.

There are important lessons that every pilot, civilian or military, can learn from this incident.

The first is not to wait too long in changing your plans when the unexpected happens. This can apply to any flight, any time, from the start of your take-off roll until your wheels stop rolling.

Second: Don't rely on any one navigational aid if there is any other way to check your position. Radar is one of the most important aids to flying today. It can get you out of spots where there is no other way to get help. But it can be wrong. If you have any way to check it—do so.

The third lesson is the constant problem of weather forecasting. The weather men do the best they can, but all pilots should recognize there will be bad forecasts and take this into consideration when planning flights. END

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Air Oasis

(Continued from page 39)

in two counties. He reluctantly went along on a survey flight of this ranch land, almost as reluctantly learned to fly. Now he requires that all his foremen become pilots and operate their own planes for ranch supervision.

Recently Larry Hunt heard about two real estate subdividers who were opening a new tract, 109 miles from Long Beach. The pair were invited for a free commuting trip by air, just to see how much time it saved. Neither was enthusiastic about flying; one even refused to fly the airlines. Now each owns a 1960 Skylane and uses it profitably in business.

"You must teach the customer how to use the product you are selling," says Hunt, "so he will be in a mood to buy it."

Much of the growth of Air Oasis is directly traceable to this steady sales effort. Larry Hunt is the author of a pamphlet titled, "18 Tips for Selling Airplanes." Written originally for Air Oasis personnel, the booklet has been reprinted by the Cessna factory for distribution in other areas of the country.

In tip #15, this booklet states, "Don't cut price. When you cut price, the clever customer wonders what *is* bottom price with your firm, anyway. When a customer isn't buying, a cheaper price seldom motivates him enough to buy. When someone says he can get the same thing for less from another manufacturer, tell him 'Every good manufacturer knows the value of what he has to sell, and he usually sets prices lower because he knows the value is lower.' Indicate that your competitor is a fine fellow, but a shrewd one, and knows how much it costs to make what he sells, and prices it accordingly . . . that you have quality de luxe and must get a better price. Don't cut price—or your competitor."

Larry Hunt came into the aviation business with a salesman's background. Prior to World War II, he spent five years as a Sales Supervisor for the National Biscuit Company. "Selling airplanes and selling cookies is basically the same," he said, "and the customer must have a use for either product."

Larry Hunt learned to fly with an hour and 45 minutes dual instruction. He and a friend bought an old TravelAir without an engine for $800 when they were in High School in Fresno, Calif. A brand new pickled World War I surplus OX5 engine, cost another $115 plus $85 freight. A garage mechanic helped the boys assemble the bits and pieces. After solo, Larry soon had a limited commercial license which in those days was good for a steady revenue in hopping passengers on week ends.

Larry enlisted in the Air Force, taught Primary at King City and wound up in the Ferry Command at Long Beach, the same field where he now operates. On one ATC ferry flight, he was in command of the famed B-25, "The Rattler," which was brought back from Guadalcanal to spark a War Bond drive. An engine exploded at night two-and-a-half hours out of Honolulu and the crew had to throw out all excess weight to stay aloft.

Hunt subsequently flew 65 missions over the Burma Hump in B-24s converted to C-109 tanker aircraft. When Hunt quit keeping a log book after World War II, he had some 12,000 hours.

After the War, Hunt asked his wife where she would like to live. She chose Palo Alto, just south of San Francisco. Hunt had planned to return to his old selling job with National Biscuit, but friends talked him into handling the parts division of Palo Airport, Inc., then distributors for Navion, Swift and Aeronca. In 1948, he moved to Fresno as a junior partner with Mal Carberry of Air Oasis. Two years later he bought out his partner and was in business for himself—three on the payroll. Larry Lacerda, now vice president and manager of Air Oasis in Fresno, handled parts. Larry did everything from passenger hopping to selling new aircraft, and an office girl kept books.

The Air Oasis name goes back to 1935 when Mal Carberry opened a flying service in Marana, Ariz.

In 1950, the Cessna factory decided to open a distributorship in the Los Angeles area and Larry moved to Long Beach. His company then comprised five persons. Seven years later, to the day, he opened his present $750,000 location on 12 acres, covered by a 25-year lease.

The Air Oasis Cessna distributorship covers Central and Southern California, Southern Nevada and all of Baja California. The organization has one dealer in LaPaz, near the tip of Baja California, where virtually all transportation is by air. Six or seven sales per year are made in this remote area.

The Long Beach operation is around the clock, seven days a week, with 89 on the payroll. From 7:00 a. m. to midnight, there is line service and "A & Ps" are on duty. Sundays and the graveyard shift are restricted to line service except for "on-call" emergencies.

On substantial overhaul jobs, the customer is usually introduced to the mechanic who did the job. This mechanic will always go along on the test hop after the work is completed.

"This is a system that we copied from the old Army Air Forces," said Hunt. "Our mechanics take pride in their work and naturally they will fly with our pilots after the job is completed. The personal contact makes the mechanics feel good and the customers feel secure in the knowledge that the job was well done."

Special hints for flight line personnel? "No, we use the same hints that everyone else can use. Each of my new line boys gets a copy of a very fine little booklet called 'Ramp Service,' published by the Flight Safety Foundation. This is our basic bible to service."

The same essential items are listed here—neat appearance, courtesy, make sure the aircraft is clean inside and out when the customer returns. "We try to go a step or two farther, of course," said Hunt. "There are special paper napkins on the pilot's seat so that he may wipe his hands after rechecking his own oil level, a book of matches with our name on the cover, and a card over the wheel that lists the services performed."

(Continued on page 112)

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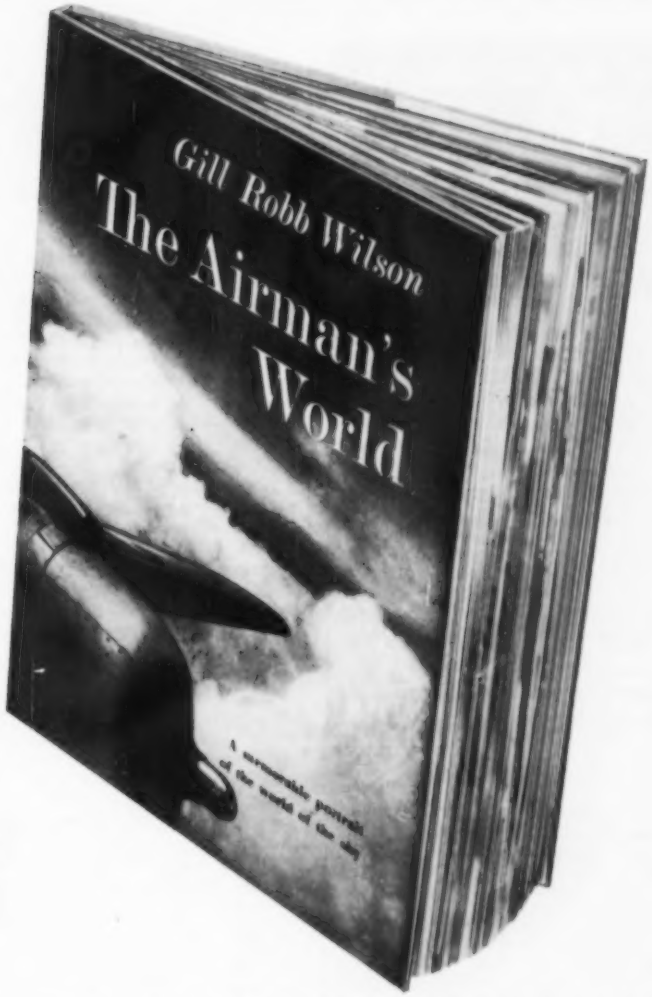

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A WORD ABOUT THE AUTHOR

Gill Robb Wilson was a pilot with the French Escadrille 66 in World War I, president of the U. S. Air Force Ass'n, president and organizer of many flying groups...and is now the noted editor and publisher of *Flying* magazine. He learned to fly just after the Wright brothers successfully propelled their flying machine above the ground, and has been one of the leading figures in aviation ever since. In his book, author Wilson conveys the feelings known only by men who are at home in the sky, and explains this exalting sensation to those who have never flown.

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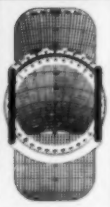

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(Continued from page 110)

In refueling service, there is always the headache of loose gas and oil caps. "If one of our line boys forgets a cap, we fine him a dollar," says Hunt. "If he has to pay two or three dollars in fines, he's usually not here anymore.

"If all the people in this country knew how to fly, instead of just five per cent, we would be at least five years behind in our deliveries," said Hunt.

Much of the Air Oasis growth is a team effort of Betty and Larry Hunt. They met in a boarding house in Modesto; she was a High School English teacher. Since their three children are well established in school, Mrs. Hunt has come into the business so that she will be able to spend some time with her husband. She is Secretary-Treasurer of the Corporation.

Air Oasis is in reality a number of separate companies. The Fresno base is Hunt Aviation, Inc. San Diego is Hunt Air, Inc. Airflite Inc. is the wholesale division working directly with Cessna, Continental, Lear and several other manufacturers. Air Products, Inc. handles parts. Air Credit, Inc. handles credit applications for new and used aircraft and works directly with the banks.

A California law forbids corporations to handle insurance, so Larry Hunt became associated with insurance man Joe DeBona, a famous speed pilot, and took out a state license to sell aircraft insurance. Hunt is able to bind policies with merely a signature, so that any new customer is covered with the insurance he requires before he leaves the showroom.

The Air Oasis operation has always been slanted toward the private and corporate pilot. It has never been associated with G.I. or other Government sponsored activities.

Mr. Hunt now sees an entirely different type of customer. Air Oasis has one of the few enclosed showrooms in the country, 14,000 square feet; one of two on the Pacific Coast.

"The showroom brings out an entirely different type of buyer," says Hunt. "Most of these are professional people, accustomed to the leisure of a showroom. Many of our sales are made today without having the new owner even fly the airplane."

One unusual aspect of the showroom is that used aircraft, even those from competing manufacturers, are featured. More used aircraft have been sold from the showroom floor than new planes.

The enthusiasm of Air Oasis is not merely centered around the high sales records being set today. "I firmly believe that private aviation is in for the biggest boom it has ever seen," said Hunt. "The fixed base operator who does not really get ready for this boom is lost. He should invest as much as he can possibly afford in hangars and offices; purchase the best equipment that he can afford and, most important, brief himself on the latest techniques of doing business. Corporate and private aviation today is a fast moving business and those who are going to get ahead in it must know how to manage people, keep books and give service." END

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Storm Over the Corridor

(Continued from page 61)

We have for some time noticed the dirty-looking build-up of clouds right in our path and we tell Gunpost we would certainly appreciate his help. We are advised to change course 20 degrees to the right. We are now entering the cloud deck and, just to be sure, we snap on the *No Smoking—Fasten Your Seat Belts* sign in the cabin. Thunderstorms are not to be taken lightly. In every well-developed storm there are areas of severe turbulence. Staying away from these is one of our missions.

The ship sways slightly to and fro, rain pelts the windshield; but a cup of coffee standing on the floor beside me has not spilled a drop and I have enough confidence in Gunpost to let it stand there.

We are close to the heart of the storm, the clouds are getting thicker, we can see lightning flashes, some of them uncomfortably close. We must be along the southern edge of the corridor, as Gunpost advises we are eight miles south of center line and to change course ten degrees to the left. As we approach the center line, the needle becomes "alive" and finally settles itself on the track again.

"Clipper 664, an Air Force plane is approaching you on opposite heading—his position eleven o'clock, 1,000 feet below you," comes our radar friend again.

"There," points my co-pilot, "slightly to your left."

Sure enough, we see the silhouette of a two-engined plane etched sharply against the clouds and closing fast.

"We have them in sight, Gunpost. Thanks," I tell him as the Air Force plane whizzes past.

By and by we are nearing Dessau where Gunpost will lose sight of us and turn us over to Berlin Control and Radar. We receive clearance and weather from Berlin and begin our descent from 9,000 feet. Just after passing Dessau, Berlin radar advises: "Clipper 664, I have five unidentified targets on your nine o'clock position, heading northwest."

I can imagine who these are, but there is nothing I can do except hug the center line. At this moment, we burst out of a cloud bank and see five jets in close formation in a climbing turn off our left side.

"They are well clear of us," I advise Berlin, as we see the Russkies zooming over us. "Roger, 664. Descend now to 3,000 feet and expect radar approach at Gatow Beacon." All we have to do now is to home on Gatow radio beacon and GCA will take us by the hand and lead us into the traffic pattern and control our descent.

Through the famous Tempelhof "slot" we descend, over the cemetery, between the apartment houses flanking it. The power comes off, the nose of the ship is gently raised and we are rolling along the runway.

"Nice flight," comments the First Officer, gathering up maps and manuals in his briefcase.

"Right you are," I reply, "but now comes danger—the taxi ride to the hotel." END

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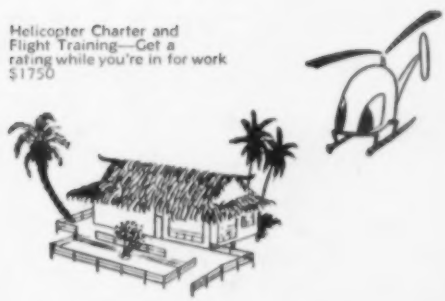

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IFR VS VFR

AS I OPENED the door of my motel room, the chill of the damp Georgia morning poured gloom into the depths of my airman's soul. We obviously would have to file instruments to drive to the airport.

It was November 26, 1958, the Wednesday before Thanksgiving, and I was to have much more to be thankful for by evening than I then realized. I was a corporation pilot, flying an Apache for a Chicago machinery broker. With my passengers, the president of the company and his wife, I departed Miami late the previous afternoon. It was dark by the time we reached Albany, so we refueled there and proceeded on to Atlanta, arriving there around 2300, and took lodgings for the night.

After a nervous breakfast at the airport, I went upstairs to check weather. It was then 0930 and the Atlanta weather was 100 feet and one-half mile visibility. Chattanooga was reporting 900 and one and Nashville 1,000 and two, with freezing rain. However, Evansville was clear and from there on into Chicago it was CAVU, so I began to consider an IFR flight, if the tops were low enough to keep me out of the icing areas. Constant checks with Weather and Center showed the freezing level to be about 7,000 feet and the tops at Atlanta at 2,500 feet. Everything seemed suitable and, by 1530, Atlanta was reporting 300 and one and one-half. Being young and bold, and with a grand total of 520 hours in my log book and five hours of actual instrument time, I filed an instrument flight plan for Evansville and, 30 minutes later, we were roaring down the runway.

By the time my gear was up, I was on solid instruments. The tower told me to call after making a left turn out, as they lost sight of me seconds after I lifted off. I turned left, called in, and was instructed to contact Atlanta departure control. I was climbing to assigned altitude as radar vectored me on course. Four minutes after take-off, I broke out on top at 2,300 feet. I was elated! My first mistake was taking off, my second and most serious was seconds away.

"Atlanta departure control, this is Apache 1451 Poppa, VFR on top at 2,300 feet, canceling IFR at 05, proceeding VFR to Evansville, over." Departure acknowledged and I went on my happy way, climbing to 6,500 for a pleasant cruise to Evansville.

Thirty minutes later the mistakes began adding up to spell TROUBLE. I glanced below me and noticed that I was now skimming the undercast at 6,500. I was concerned as I noticed a slope ahead and climbed to 8,500. This was sufficient for another ten minutes, but to remain 1,000 on top, I then had to climb to 10,500. I was estimating Chattanooga Omni in seven minutes, when suddenly I realized that the tops were rapidly sloping to around 14,000 feet. It was now totally dark. I had left the oxygen tank in Chicago to make allowance for extra baggage.

I began holding VFR and called Chattanooga radio for an IFR clearance at 6,000. They said it would be at least 20 minutes before Center could give me six. I said I'd wait and kept holding. Five minutes later, Chattanooga called and cleared me to Evansville at 10,000. I refused, explaining that I had no deicers. Another five minutes elapsed and I was cleared to proceed at 8,000.

I reluctantly accepted, and began a let down on course. I reported at 8,000, but, shortly after reaching this altitude, began getting moderate wing icing and having difficulty in keeping the propellers synchronized. Prop ice flashed through my mind and my flashlight showed more ice building on the wings. Pitot heat was my only weapon against a giant who regarded such pathetic resistance as child's play. I then pushed the "panic button" and pushed it hard!

"Chattanooga radio, Apache 1451 Poppa, one minute south of the omni at 8,000 IFR, picking up heavy ice. Request 6,000 feet, over."

Chattanooga gave me the most difficult of orders to carry out under tension—*"Stand by, five one Poppa!"*

What seemed like an hour later, but in reality only 30 seconds, Chattanooga called back. "Five one Poppa, ATC cannot give you another altitude due to traffic below you, over."

"Five one Pop, Roger. I'm declaring an emergency. We'll land at Chattanooga, over."

"Five one Poppa, understand you're declaring an emergency. Is that correct? Over."

"Five one Pop, affirmative, out of 8,000 and descending."

"Roger, Five one poppa. You are cleared to the back course of the Chattanooga ILS. All altitudes are clear below you on the back course."

He proceeded to read off the Chattanooga weather, as I switched on the cabin lights. I couldn't see anything but soup outside and I wanted a good look at the gauges. I flipped to my Chattanooga ILS approach plate, but in my panic turned to the front course approach. Upon finding no transition heading, I began a tight spiral. The Great Co-pilot was with me, as I broke out directly over the city at 3,700 feet and the ice was gone.

After landing, the tower informed me that no traffic was moved for me, as only the front course was busy, so I didn't have to fill out a report. I thanked them profusely and stepped to the ground, a wiser pilot.

BRADLEY RUTTENBERG

Glencoe, Ill.

Maintenance Tips

(Continued from page 58)

moisture and rain from running down the blade in a vertical position, but from getting into the prop pitch-changing mechanism covered by the spinner.

Check metal props for wobble on the shaft and for oil leaks around the hub, in the case of a constant speed prop. Check the propeller control system for security of attachment, freedom of movement, and loose or worn bearings. Be sure that all exposed nuts are tight and properly safetied. Examine the spinner for cracks, chafing of the blades, or looseness.

- *Fabric covering*—This item represents a big liability to the owner. A recovering job runs from $500 to $800. To get maximum life from fabric, the owner should follow two basic rules. The airplane, when not in use, should be protected from strong sunlight in the summertime, and from hail, snow and freezing rain in the colder months.

The second basic rule is to keep the fabric clean. This can be done by using fresh, cool water and a mild soap. If grit is not removed from the tops of wings and other plane surfaces, it collects moisture overnight. Wind action then causes grit to pit and scratch the finish of the fabric. This action is particularly damaging near the seacoast or in industrial areas.

All fabric on an aircraft should be taut; and all seams sealed. A surface which appears sunbaked and brittle, or has rings or check marks in the finish, or cracks along some of the structural members, should be pointed out to a mechanic for his opinion. If a repair is indicated, it might be over only a small area whereas, if no repair is made, the damaged area might let go in flight and whip the tear far into the good fabric. This would result in a large repair bill, plus a few minutes of uncomfortable flight.

Other points to check are the drain holes on the undersides of the wings near the trailing edge. See that they are open. Sometimes they get doped over during repairs or become clogged with dust. The purpose of the drain holes is to let the moisture escape from the inside of the wing. If the holes are plugged, the inside of the wing can become steamy because of trapped moisture. This is hard on glue, wood, metal and fabric.

- *Metal covering*—Actually little attention need be given the metal covering of an airplane, if it is painted or free from corrosion. Look for any unnatural bulge, loose screws and rivets, and separation of seams. Peek inside the fuselage for cracked bulkheads. Metal airplanes should be washed frequently to aid in protecting the finish. Cool, fresh water, mild soap, and a soft brush will bring out the luster in the paint job of most planes.
- *Engine*—As the cowling is removed, inspect it for cracks and loose fasteners. Improper fit on the part of the fasteners can permit the cowling to come off in flight. The cowling, in addition to providing proper circulation of air to cool the engine, streamlines the plane and insures

(Continued on page 116)

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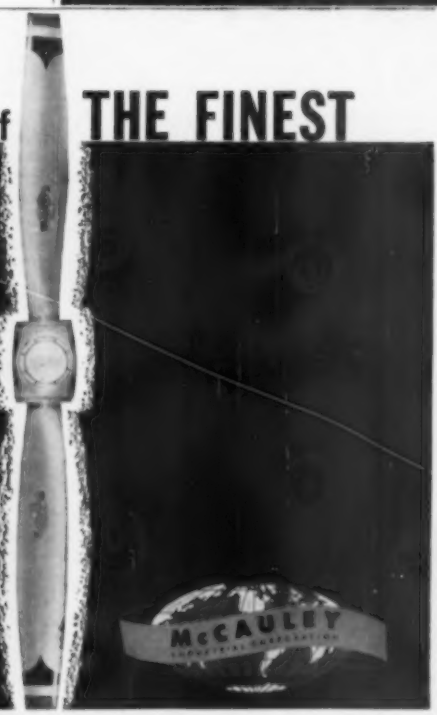

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(Continued from page 115)

safer flight characteristics.

If the engine is free of oil splashes and grease, it is a good indication that all is well under the cowling. But, if excessive oil is found, then examine oil lines and connections for chafed and worn parts. Make certain that the oil tank is secured and sealed to the engine, and is free from cracks which usually appear near the filler neck or along the beading. Oil seldom leaks rapidly enough to indicate the location of leaks, but they can be spotted by wiping away telltale smears and watching for a dark, irregular hairline to appear on the metal.

From the oil system, proceed to the manifolds which deserve equally careful attention. A defective exhaust can mean fire. Look for thin spots, cracks, and loose bolts along exhaust stacks and pipes. Also check for loose nuts on the base of the cylinders and on accessories such as the carburetor, starting motor, and magnetos. If loose nuts are discovered, have an A&P tighten them with a torque wrench. This is a special type of wrench which allows the user to determine the amount of foot/pounds being applied. It is important that such bolts be tightened exactly to the proper amount as determined by the engine manufacturer. Then swing your inspection to the engine mounts, looking for cracks, loose or worn bolts. Inspect the cross assemblies for rust and cracks at the welds.

At this point look at the fuel system. Check fuel valves for leakage in both the "on" and "off" positions. Slow leaks usually will be revealed by the dye in gasoline. Be sure to examine the fuel line which runs from the firewall to the carburetor. Usually this line is a flexible rubber hose type, and it can become deteriorated and drip fuel.

• *Wheels and brakes*—For a thorough inspection, jack up each wheel and remove from the hub. This is just a matter of removing the hub plate, extracting a cotter pin and backing off the hub nut. The entire wheel can then be removed. When in the clear, examine the brake assembly for freedom of action and range of movement. If the brake lining is glazed, it can be roughened with sandpaper. This usually will take the squeal out of the brake as well as giving better braking action.

Before replacing the wheel, inspect the tire for excessive or under inflation. Check sidewalls for brakes and stone bruises, keeping in mind that oil-impregnation and weather checking are other tire enemies. When replacing the wheel, pack with fresh grease and turn up the hub nut with finger pressure only. Insert a new cotter pin, put on the hub plate and the job is about done. But, before removing the jack, spin the wheel to ascertain that it turns freely and that brake pressure will stop it.

• *Replacing metal screws*—One particular chore which can add dollars to a shop bill is that of tightening and replacing the metal screws which are found along the edge of fairing and other places. The chore is simple, yet many owners overlook it. All that is needed is a screw-

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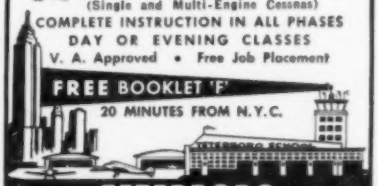

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driver and a box of metal screws of assorted sizes. Or, if you wish to do a deluxe job, include a small bottle of shellac in your supply.

Metal screws become loose from vibration, and it is an easy matter to tighten them into a light-pressure lock. Do not attempt to draw them up as tightly as wood screws or they will strip. If the metal screw draws up to a firm lock, it can be left in that position or removed, dipped in shellac and tightened again. This will seal it in place so that it will not be affected by vibration. On the other hand, if a metal screw will not draw up, but keeps slipping, it should be removed. Examine the hole and if the metal is ragged around the circumference, flatten it with the blade of the screwdriver. If the hole is still too large, then use the next larger size metal screw.

● *Cables, hinges and pulleys*—Inspect control cables for fraying, rust, grease and tension. The easiest and safest way to check for fraying is to wipe the cable on both sides of a pulley or guide with a loosely held cloth. Broken strands will snag the cloth, indicating the frayed area.

Rust is progressive on cables and should be removed. One of the convenient ways is to hold fine steel wool in the palm of a gloved hand and work up and down the cable.

If grease is found on cables, remove it. Grease catches grit and sand to form a cutting compound which speeds wear. While looking at cables, also feel for tension. This is important, as too little tension may mean a broken pulley or pulley bracket; too much tension will cause excessive wear. Cables should be firm; not so loose as to flap, nor so tight as to bend a pulley bracket. At this point, if the cables are in good condition, the oil can is brought into play. Attention is then shifted to pulleys and hinges. Every pulley and hinge which can be seen and reached should be given a drop or two of light oil, unless the aircraft manufacturer indicates that specific pulley should be cleaned with carbon tetrachloride. Pulleys should turn freely and not show flat spots. Hinges should not bind or be too loose. This causes excessive wear.

Pulleys will generally be found (depending upon the type of aircraft involved) in the cabin, at the opposite end of wing struts, and within the wings. Hinges will be found on all control surfaces, including the tail group and the ailerons.

By setting up the practice of preventive maintenance, a pilot-owner will soon realize the savings on upkeep. He will find the work light and interesting, and each time he performs it, his proficiency will increase.

Also there is an intangible gain—that of knowing that one's airplane is airworthy, a fact that brings peace of mind to the pilot and allows him to enjoy the full pleasure of flight. END

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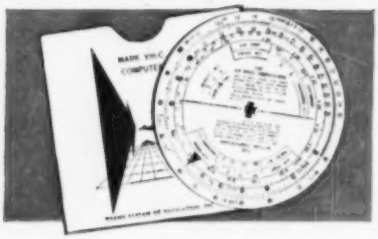

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Airborne Samaritans

(Continued from page 56)

is no other way for us to serve the health and medical requirements of our people without losing valuable time—and time is most often critical—or without exposing our patients to additional physical discomfort and torture through the use of surface transport."

Lt. Col. William Hausman, Assistant Chief, Neuro Psychiatry, at the U. S. Army's Letterman General Hospital in San Francisco, says, "Although this unique service is for the armed forces family, it also helps broaden medical know-how by bringing rare problems of medicine, science and pathology to our established medical centers where doctors and technicians under training can obtain a higher degree of proficiency than has been possible before." If it were not for the aero-med lifeline, he believes it would require years and years for a doctor to acquire the same type of experience and exposure to rare diseases and world health problems. Now MATS delivers it to his own training laboratory. He believes the accumulative health and medical benefits accruing from this high-speed communication system are beyond monetary evaluation.

Air-Evac is headed by Brig. Gen. L. Render Braswell, who reports that this around-the-clock, seven-day a week service links some 350 U. S. hospitals of the four major military services, the Veterans' Administration and the U. S. Public Health Service. Yearly traffic exceeds 40,000 patients who are moved on an average of 1½ times. Of this number, 11,000 come aboard the mercy planes at foreign stations for transfer to the U. S. The remainder are from domestic installations.

All of Air-Evac's work is not military. Its service to the public is specialized and vital to the health and safety of the average citizen. Its planes are used to transport polio victims for the U. S. Public Health Service. This mission alone has meant the difference between life and death on several occasions.

In fact, MATS personnel designed the lightweight iron lung, 16 of which are positioned at key points in the world to facilitate fast and safe movement of those stricken down with the dread disease. Ingenuity inspired by its mission has resulted in the design of a special light-weight incubator, a special life preserver for patients and a new constant traction aircraft bed. The latter was designed by Lt. Col. Joseph Collins, Commanding Officer, Aero-Med's Hawaiian based unit.

Special charges for non-military users of MATS Good Samaritan planes are made for this important humanitarian service. In most cases they approximate regular commercial airline fares plus one dollar. Unusual operations requirements are charged in accordance with the effort involved.

In the international relations department, Air Evac shows no discrimination between U. S. uniforms and those of other nations. It provides the airlift for members of United Nations forces who are still standing guard in Korea. Its pilots and crews are proud of the fact that no member of the Allied military or diplomatic team is more than 60 hours from adequate medical care. Jet speed planes would cut this en route time by a wide margin. Aero-Med files at San Antonio, Tex., headquarters, are filled with words of praise for the crews and thanks for the fast work. The letters are from foreign governments, officials, diplomats, soldiers under foreign flags, as well as from citizens of the U. S. who have benefited from this highly skilled service.

Equipmentwise, Air Evac planes are all-piston-powered transports, outfitted for litter and ambulatory patients. Twenty-nine Convair C-131 twin-engined Samaritans carry all of the short-haul movement of patients within the U. S. They use some 250 airports where runways average 4,000 feet or less.

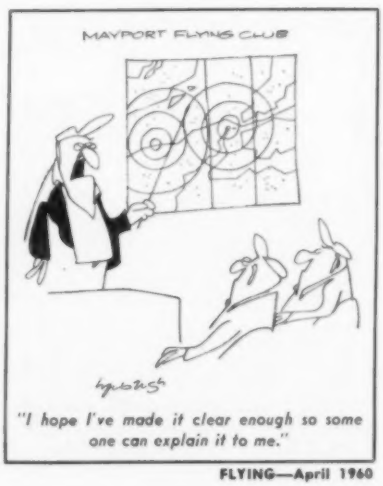
Overseas airlift for the sick and injured is confined to regular four-engined transports of the C-118 (DC-6) type used on routine MATS long over-water flights. In fact, all U. S.-bound patients are moved on regular MATS passenger flights.

Other types of equipment such as SA-16 Albatross amphibians, helicopters and smaller aircraft needed to reach remote installations, are employed wherever the terrain and conditions require their special performance features.

Naturally, Air-Evac personnel, especially the air crews, are hopeful that jet age equipment can soon be made available for this important work. They believe the higher speeds, less noise and vibration, as well as jet plane superiority in bad weather flying, would tie the armed forces family closer together. They estimate that turbine-powered transports would reduce overseas en route time by 25 to 50 per cent.

Pure jets are desired for the long haul runs and radar-equipped four-engine turboprops of the Electra type are a stated preference for the domestic, short haul missions.

Despite the fact that organizations and members of Congress are questioning MATS' need for jet transports, the highly efficient safe operating Air-Evac mercy service is beyond criticism. END



"I hope I've made it clear enough so some one can explain it to me."

A New Era

(Continued from page 41)

over wings and fuselage.

Smaller cabins will give functional design criteria providing higher performance, a sacrifice Lear thinks executives won't mind when they see what they're getting for their money.

What they're getting will be military jet performance in a startling new type aircraft combining the best of aerodynamic design and systems engineering advances available today.

The result will be a five to six place twin jet that will fly at Mach. 75 at 25,000 feet—about 525 mph true air speed—burning 80 gallons of fuel an hour.

Such an executive jet will have a 1,200-mile range and will fly under sea-level cabin pressurization with noiseless comfort and complete electronic reliability.

A simplified instrument panel will make the pilot's job easier and, instead of flying a wheel like a truck driver's, a simple, short stick, controlled with wrist movements, will take more sweat out of flying.

Weighing in the neighborhood of 7,500 pounds, the executive jet will carry tip tanks for added range, and feature a rather small T-tail design made possible by lightweight Lear automatic stabilizers.

Lear mentioned one other idea he believes will bring in his dream ship for $100,000—boundary layer control.

"Today's jet airliners and military jets get their high speeds from brute power," he said. "Much of this power is needed to lick skin drag. One hundred horsepower of boundary layer control is worth 2,250 horsepower of brute thrust."

Lear firmly believes a simple, effective boundary layer control system of suction and blowing is feasible, would greatly increase speed and lift, and could be used to slow the ship in rough air, simply by shutting off the boundary layer control.

On landing, he added, an automatic valve would shut off the system when the wheel struts compress, reducing the lift coefficient instantly to eliminate any tendency to bounce.

"It's all within the realm of reality today," Lear concluded. "We don't need invention—simply application. We will, however, need clever tooling, new production methods. The market for such a ship will run to 500 a year shortly after the executive jet proves itself."

And while Lear is not in the aircraft manufacturing business and doesn't intend to enter that field, he is worth listening to, as a man who for 30 years has championed increased safety and utility of general aviation and who, as a flying executive, has developed and test-flown revolutionary miniaturized electronic systems of his own design.

As he began packing to return to his headquarters in Switzerland, where Bill Junior runs the store for Lear's European Division, Dad Lear said soberly:

"You know, aviation has been pretty good to me . . . I'd like to make a real contribution in return."

His dream of a hot executive jet could be it. END

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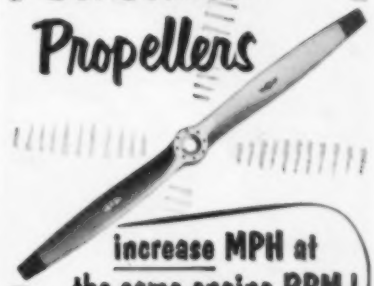

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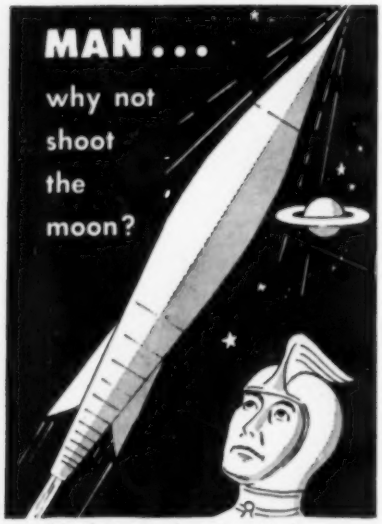

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Antique Aircraft Factory

(Continued from page 59)

In many cases the wooden spars and other structural parts have been shattered, and new parts must be formed. For example, the cloth covering on older planes has rotted. The Air Museum hired an expert seamstress, Mrs. Ruth Male, to do fabric replacement work. She is now recovering the horizontal stabilizer of Vin Fiz, a Wright plane that was the first aircraft to fly across the U. S.

Mrs. Male spent several days experimenting to match the handstitching used on the original covering. After she is finished, another expert takes over to apply the correct finishing compounds, and the designers would be hard-pressed to tell the restored plane from their original model. Paint mixing is a precise job, too. Several test batches are mixed before the precise shade is achieved. Pitted pistons and other mechanical parts are cleaned, polished and coated with preservative before being reassembled.

U. S. aircraft manufacturers are providing assistance by building missing parts for the old aircraft and engines. Some of the manufacturers have offered the services of skilled production workers who helped build the models being restored. These firms also are providing additional technical assistance with drawings and tech orders. This technical data will be filed at the Silver Hill facility for the use of researchers, engineers, and historians. Aircraft that cannot be accommodated at the Museum can be inspected there.

Restoration of German, Japanese and Italian planes poses a tough research problem. Technical drawings cannot always be obtained, and many of them are damaged. Technicians must work from photos and other sources of accurate information.

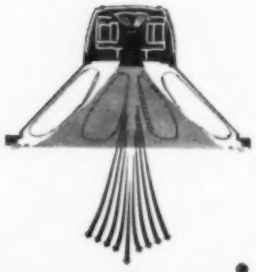
Philip S. Hopkins, Director of the National Air Museum, points out that the Museum receives hundreds of inquiries from hobbyists, authors and researchers seeking accurate details on old aircraft, both American and foreign. Recently, an Australian wrote requesting information on the system of gun-mounting used on a World War I fighter. The Museum, after a search of the files, was able to help.

Mr. Hopkins, who was appointed Museum Director in 1957, notes that there has been a revival in recent years in the construction of old aircraft models by various clubs and individuals. "The Air Museum is the recognized authority on historic aircraft," he says. "We must be correct in every detail. If we use an orange fuselage stripe on a plane when the original color was a crimson red, we get a number of strong complaints."

Famed aircraft such as the Wright Flyer and the Spirit of St. Louis are already on exhibit in a Smithsonian building, sharing space with such unrelated memorabilia as stagecoaches, stamp collections and the dresses worn by Dolly Madison.

The present Aircraft Building of the Smithsonian, a venerable "temporary" built during World War I to test Liberty engines, is being re-done and some of the

(Continued on page 123)



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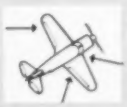

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aircraft will be housed there, pending construction of a permanent building. The Museum, after a series of starts and stops dating back to 1946, is now in the architectural planning stage. A prime sight-seeing location along Washington's Mall has been staked out. But completion is at least five years away.

The work of restoring the aircraft and engines will require many years, and there are new additions coming along. The Air Museum already has put in its bid for the X-15 and the first Mercury capsule that puts man into orbital flight. And decades from now, sight-seeing teenagers, familiar with inter-planetary spacecraft, probably will describe them as interesting but terribly crude. END

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Briefings . . .

(Continued from page 14)

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MCMILLAN INDUSTRIAL CORP., Ipswich, Mass., has announced availability of a radome assembly for the Convair 240-340 and 440 aircraft. Designed for executive transport or air carrier use, the McMillan kit—PN 718 X—consists of a honeycomb radome, together with all attachment hardware and provisions for mounting an 18-inch antenna. Secured by quick action fasteners, the dome is hinged for easy action.

TO TAKE ADVANTAGE of a higher thrust Rolls Royce Conway By-pass engine which will be available in 1963, Boeing Airplane Co. plans a still bigger jet transport. Designated the 707-520, it will have a maximum take-off weight of approximately 340,000 pounds, compared to some 300,000 pounds for the Conway-powered 707-420s which are entering airline service this spring.

JAMES C. "JIM" WELSCH has resigned as vice president of Frederick B. Ayer & Associates to return to his own Welsch Aviation Co. at 60 E. 42nd St., New York City. A veteran of 36 years in aviation, Welsch in 1951 organized Welsch Aviation to specialize in buying, selling and brokerage of executive aircraft for the corporate market. He relinquished his interest in the firm when he joined Ayer. Present plans call for company reorganization and additions to Welsch staff.

AN ANTI-STATIC Plexiglas and glass cleaner has been introduced to the aviation market by Renewize Manufacturing Corp., Wayzata, Minn. Major advantage claimed for the Renewize cleaner is that, whether applied to Plexiglas or regular glass, it does not leave an oily film that will cause dirt accumulation, fogging or distortion. For aircraft usage, it is packaged in 12-ounce plastic squeeze bottles, one and five-gallon cans; 30 and 50-gallon drums.

LANDING FEES for all itinerant became effective March 1 at Detroit's Metropolitan Wayne County Airport. Fees are based on weight of aircraft. A minimum of $1 for private and commercial aircraft weighing up to 3,000 pounds; $1.50 private and $2 commercial for planes 3,000 to 7,500 pounds; $2 and $4, respectively, for the 7,500 to 12,500 class; on up to $25 for private and $50 for commercial planes in the 125,000-pound category, and over. For aircraft arriving from outside the country, an additional fee of approximately $1 per passenger is assessed.

HOW CLOSE IS "CLOSEST"? Within five-minutes walk of Main Street, after a free lift across Wolf River by ferry, Memphis (Tenn.) Downtown Airport lays claim to being "the closest landing strip to any metropolitan area in America." Open 7:00 a.m. to 11:00 p.m., the airport runway is 3,100 feet, hard-surfaced, and with lights. Its facilities include hangar, fuel, unicom, pilots' lounge. There is free cab service to major hotels (45 cents anywhere downtown). No landing fee.

ATLAS HELICOPTER SERVICE of Omaha, Neb., founded recently with the backing of a group of mid-western businessmen, has started operations with a Vertol 44, 15-19 passenger helicopter transport. The company plans a wide range of industry services, including passenger charter flights.

TWO-WAY RADIO may be required for all planes operating in terminal control areas if, as it appears likely, FAA's proposed rule-making to this effect goes on the books. According to its spokesman, FAA is also considering control area speed limits, but does not as yet plan to provide special "corridors" for segregation of civil jet traffic.

ERNIE GENTRY, proprietor of Daggett (Calif.) Gentry Airport, has moved to expanded facilities on the New County airport at the Daggett Radio Site (Los Angeles chart) midway between Las Vegas and L. A. The field, open 24 hours a day, has two hard-surfaced runways, the longest 6,500 feet; rotating beacon, runway lighting and weather service.

PIPER'S new twin-engine, five-passenger, Aztec has been selected by the U. S. Navy to fill its requirement for an economical utility aircraft. The selection came after an examination of detailed cost and technical proposals submitted by manufacturers of aircraft in this category. Firm contract for procurement of an initial quantity of 20 has been signed.

FROM AN EXCLUSIVE yachting and fishing club of some years standing, Ocean Reef on North Key Largo, Fla., is being transformed into a complete residential resort community. Accessible by land and sea, heretofore, it now boasts its own airport with two runways, the longest a 2,500-foot paved strip. It is 30 air miles from Miami International Airport. In foreground above is the famous Ocean Reef Inn and Cottages, while at upper center can be seen the N-S paved runway of the airport. At left is the golf course and first section of 300 homesites.

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